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MEDICAL AND SURGICAL REPORT

OF THE

PRESBYTERIAN HOSPITAL

IN THE

CITY OF NEW YORK

VOLUME II
JANUARY, 1897

EDITED BY

ANDREW J. McCOSH, M.D.
WALTER B. JAMES, M.D.

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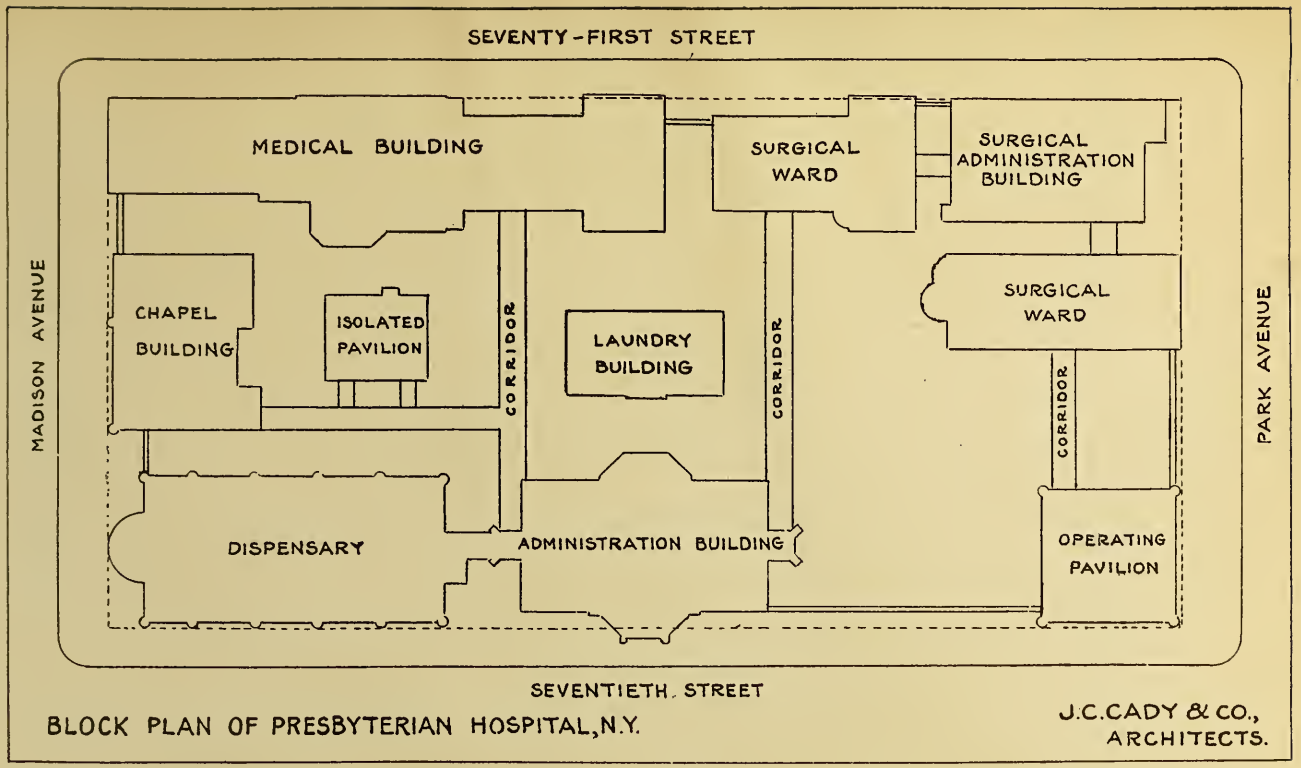

BLOCK PLAN OF PRESBYTERIAN HOSPITAL, N.Y.

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I.

CHOLELITHIASIS AND SURGERY OF THE BILE-DUCTS.

By Chas. K. Briddon, M.D.

During the last few years medicine has contributed but little for the amelioration of the condition known as obstructive jaundice, and the value of the more prominent of the remedies introduced during that period have been recognized by some and rejected by as many others. A review of the literature of the subject has not been as instructive or as satisfactory as might have been desired, but has not been altogether barren of results, and would appear to warrant the following conclusions: Laboratory researches have proved that the inorganic salts of sodium and potassium have no solvent action whatever on gall-stones, but certain vegetable oils, oleic acid, and animal soap have a decided solvent action. Brockbank (*Med. Chron.*, xix., page 152 *et seq.*) says that although the salts referred to, including especially the phosphate and salicylate of soda, have no solvent action on the concretions themselves, they are useful in promoting the secretion of bile, and in that way favoring the elimination of the smaller masses. The use of olive oil was introduced years ago, and it has been asserted by those who opposed its use that the masses recovered from the dejecta of patients whose acute attacks of colic were being treated by the administration of oil, consisted of nothing more than masses of saponified fat. It is probable that during such treatment altered fat, resembling small concretions, might be found, but it is also possible that real stones might pass at the same time, and escape observation. At all events, the preponderance of evidence appears to be in favor of such treatment, the theory being that fatty acids form after taking oil, and that these keep the cholesterin in solution, and may even re-dissolve it after precipitation.

The Committee of the Therapeutic Section of the Philadelphia

Polyclinic Medical Society reported that positive relief was afforded in ninety-three per cent. of the cases. Dr. Goodhart (*Brit. Med. Jour.*, page 219, i., 1892) reported five cases treated by oil with good results. From a study of these, and numerous others in which excellent results have been obtained, it would appear proper to give the sodium salts, preferably the phosphates, and salicylates, in the intervals, and vegetable oil during the attacks.

There will always remain a large percentage of cases that are not amenable to medical treatment. I do not refer to the cases of malignant disease of the gall-bladder, or of the ducts, or to the cases of tumor pressing upon the same, which ought to be regarded as inoperable, unless complicated with stone; but to those in which the concretions are too large to pass, in which their frequent passage is associated with unendurable agony, or in which life is imperilled by some local or constitutional complication. Such conditions will bring many cases into the domain of surgery, and the achievements in that field have been so brilliant, its scope being constantly widened and made possible by the improvements in technique, as to make its results really little short of marvellous. The first attacks, naturally, were made upon the gall-bladder, but now there is no part of the ducts, or their annexæ, from their emergence from the liver to their termination in the duodenum, that has not repeatedly been made the subject of successful operation.

The manuals of anatomy with which I am familiar do not contain sufficiently explicit facts to satisfy those who may be called upon to make investigations on the living, and we have to look to the special studies that have been recently made by those to whom we are indebted for what we now know of a hitherto imperfectly explored region. An excellent paper on the "Surgery of the Gall-ducts," by Maurice Richardson, gives a valuable description of the surgical anatomy of this region, based upon dissections made at the Harvard Medical School, and many valuable suggestions on the surgery associated with the same (*Annals of Surgery*, vol. xviii., 1893). I would also suggest a study of an original communication on the gastro-hepatic omentum, by Byron Robinson, in *Med. Rec.*, August 10, 1895. The illustrations by the author, and those copied from Henle and Luschka, give a clear and comprehensive idea of the somewhat complex arrangement of the peritoneum connected with the stomach and liver. Believing that a careful consideration of

these plates and of the explanatory text will repay the practical surgeon, and recognizing that most of these folds are the key to the disposition of the ducts and important vessels, I do not think that a knowledge of their various dispositions is essential, inasmuch as they are inconstant, and their presence, absence, or modification is apt to bewilder the operator. It will be a source of gratification to those who are likely to come in contact with such cases to be aware that in most, if not all, obstructions, where adhesions do not mask existing conditions, it will be possible to trace the dilated ducts from the gall-bladder to the concretion. In the remaining cases where the gall-bladder is empty or contracted on its contents and bound to adjacent viscera by adhesions of ancient or recent date, normal anatomy will afford but scant information, and only by the very careful and frequently tedious separation of such bonds shall we be able ultimately to arrive at a solution of the pathological conditions that confront us.

Dr. Rutherford Morrison, in an original communication to the *British Medical Journal*, November 3, 1894, page 68, draws attention to the anatomy of the parts concerned in the surgical treatment of gall-stones, with the object of demonstrating the existence of a pouch below and behind the right lobe of the liver, which is more or less isolated from the general cavity of the peritoneum. "If the abdomen be opened in the right semilunaris, the sharp lower border of the right lobe of the liver, with frequently the fundus of the gall-bladder, will be seen resting against the transverse colon; if the liver be drawn upward and the colon downward, a space previously potential is exposed. The roof or anterior wall which has just been opened up is not sealed, it looks forward and to the right. From right to left it is formed by the peritoneum covering the diaphragm, the under surface of the right lobe of the liver and the gall-bladder, and not unusually is completed internally by a fold of the gastro-hepatic omentum, continued to that viscus. The floor is formed by the ascending meso-colon covering the kidney, duodenum, and other structures lying on the posterior abdominal parietes. Superiorly the space is bounded by the right lobe of the liver. Inferiorly by the ascending layer of the transverse meso-colon, covering the duodenum internally. Externally by the peritoneum lining the lumbar parietes, as far downward as the iliac crest. Internally by the peritoneum, covering the spine behind, the free edge of the

gastro-hepatic in front, and the foramen of Winslow between the two."

This space he says can be effectually drained by an opening made through the posterior parietes immediately below the lower end of the kidney ; he also states that a varying quantity of fluid, roughly estimated at about a pint, can be introduced into this pouch before it overflows into the general cavity of the peritoneum; for the purpose of securing good drainage, he recommends in all operations on the ducts an incision commencing over the right rectus muscle, an inch below the tip of the right rib, and extending back into the loin, midway between the lower costal margin and the iliac crest.

There remain now only a few points in the operative technique that seem to me to be worthy of consideration, and some of which I am convinced have aided me in the later steps of the operation. First, the position of the patient, either the reversed Trendelenberg, or, as I have found more convenient, straight dorsal, with the feet planted against a foot-piece temporarily attached to the table, which is fixed at an angle of about forty-five degrees ; if flexion of the knees is prevented by a broad bandage securing them to the table, nothing more is required to ensure the advantages of position.

With regard to the incision in the abdominal wall, some prefer a vertical one in or to the right or left of the semilunaris ; to this has been added such transverse ones as conditions met with in the operation might appear to indicate. I do not remember to have used the vertical one myself, having always preferred the obliquely transverse incision of Courvoisier. It affords abundance of space, and beginning near the semilunar line, it may be carried back as far as is necessary for drainage in those cases that may require it ; but I should scarcely think it would often be desirable to extend it as far back into the loin as advised by Morrison. It has been objected to these transverse incisions that they invite hernial protrusions of the hollow viscera. Morrison says he was indebted to Dr. John Duncan, of Edinburgh, for the knowledge that transverse incisions in this region give better access and are less liable to be followed by ventral hernia.

Where the gall-bladder contains stones, and is dilated, I would by every means in my power, aided by elevation of the liver and displacement of the colon downward and to the left, endeavor to trace the ducts to their termination ; for I believe that simply opening the

gall-bladder and emptying its contents, when there are obstructions in the ducts, is an incomplete procedure, and may not in some cases even afford temporary relief. In cases where calculi are lodged in the ducts, the greatest care should be used to bring them as near the surface as possible before attempting to liberate the stone by incision, and that all openings made into the ducts should, if possible, be closed by careful suture. In those cases where the duct is contracted above, below, and upon the concretion, I question whether suturing would be feasible; but when the duct is dilated on the proximal side, it would probably be better to make the incision in the dilated portion, and to push the stone back through the opening, and in that way secure a condition that would admit of the application of a suture; in either case, it would be proper to drain. In the cases where the ducts are left open, they might be drained into the pouch referred to, a tube, supplemented by gauze passing through the posterior end of the incision. Where a successful suture has been made, gauze would suffice, its exit being at any point on the surface.

Case I. Cholecystenterostomy following Choledo-lithectomy.

M. G, aged thirty-eight; single; domestic; Irish.

Previous History.—One year ago, and again six months later, she had attacks of pain in the region of the gall-bladder. These attacks lasted about two days. The pain was continuous, not severe, not accompanied by chill, fever, sweating, or jaundice, and patient was able to be up and at work. Her bowels had been constipated, but stools never clay-colored, and she has never noticed any gall-stones in her stools. No alcoholic habit. No syphilis. Otherwise she has been well in every way until her present illness. This began August 28, 1895, two weeks before admission. Her first symptom was a sudden gnawing pain felt just below sternum, coming on after meals and lasting an hour or two. It was accompanied by vomiting, but there was no chill, fever, or sweating. Two days later she became jaundiced. Pain now became continuous and accompanied by fever. Her bowels have been very constipated, but stools have not been clay-colored. For the past week has noticed tumor in right abdomen. She has very rapidly emaciated.

Physical Examination on Admission, September 11, 1895.—Patient somewhat anæmic and considerably emaciated. Skin and conjunctivæ highly jaundiced. Lungs and heart negative. Ab-

domen soft, not distended, and not particularly tender. Liver-dulness increased. Edge felt about two inches below costal border. Projecting from under surface of liver at a point just below point of tenth rib, and extending to a point about two inches below level of umbilicus, is a large tumor, semi-fluctuating and somewhat movable, at times slightly tender, apparently a dilated gall-bladder. Other abdominal viscera negative.

Urine.—Sp. gr., 1025 ; turbid ; alkaline ; trace of albumin ; much bile ; pigment ; few casts. Temperature, 99.4° F. ; pulse, 88 ; respiration, 28.

Since admission patient has complained of continual pain in the region of the gall-bladder, and of annoying itching. She has had two or three attacks of vomiting.. Her stools have been clay-colored. On account of her rapidly failing condition, immediate operation was decided on, with the object of removing, if possible, the obstruction in her common bile-duct.

September 18. *Operation.* — Anæsthesia was established by ether. Patient in reversed Trendelenberg position ; angle of trunk, sixty-five degrees. A curvilinear incision of six inches was made one inch and a half below, and along the border of, the right ribs. In the thin edge of the right lobe of the liver was a circular patch, two inches in diameter, which appeared as if the tissue proper had been entirely absorbed and replaced by red granulation tissue. The gall-bladder was distended into a large sac, reaching at least two inches below the level of the umbilicus. Its walls were of a light lemon-color, leading to the belief that we had to do with an empyæma, but the introduction of a trocar gave exit only to light-colored bile, quantity estimated at eleven ounces. When empty, it was drawn well up outside the abdominal walls, and the enormous cystic duct could be traced down to its junction with the common duct, which was dilated to the size of the index finger. Tracing the latter to the point where it disappears behind the duodenum, no cause of obstruction could be found. An incision was then made into the peritoneum, outside the second division of the duodenum, which was drawn well toward the median line. A finger introduced into the space behind the intestine, and toward the head of the pancreas, came in contact with a foreign body, which further examination proved to be in the common duct at its junction with the gut. With considerable difficulty this was brought sufficiently near to the surface to

permit of a section through which the calculus escaped. It was a very light calculus, apparently of pure cholesterin, pear-shaped, without facets, weighing only fifteen grains, and measuring an inch and a half in its largest circumference. No attempt was made to suture the opening in the duct. It would have been impossible and useless. Considering it probable that the process of repair in the duct would lead to its stenosis, it was thought advisable to institute an anastomosis between the fundus of the gall-bladder and the duodenum, and this was easily accomplished through the medium of one of Murphy's buttons, the only difficulty encountered being occasioned by the condition of the gall-bladder; its walls were dense, resembling parchment. They had lost all their usual elasticity. When empty, they did not contract, but fell into large folds, which condition required a larger hole to admit the half of the button, and a little more suturing to close it around the cylinder; however, this was soon accomplished, and there was no difficulty in approximation. The operation was concluded by introducing a tamponade down to the opening in the duct, and diminishing the size of the opening in the abdominal wall by the use of a few silk-worm-gut sutures.

Patient was considerably prostrated by operation, but responded readily to stimulation. On the day following (September 19) there was less bile-pigment in the urine, and icterus was markedly diminished.

September 21 (three days later). Jaundice has almost disappeared. She has occasional pain and is still very weak; temperature averaging about 103° F.; pulse, 125. During this time she has been nourished by small doses of peptonized milk by mouth and rectal enemata. It was deemed advisable to move her bowels. The result was a large yellow liquid stool, showing that bile was passing into intestine.

September 23 (five days after operation). Wound was dressed and found perfectly clean. There was no evidence of any discharge of bile. Her general condition is better in every way.

October 1. Patient shows much improvement. There is still slight temperature—pulse averages about 100. Jaundice has entirely disappeared, and her urine is free from bile-pigment, but contains some pus and a few casts. Wound has almost healed; movements are formed and bile-stained. Button has not been passed.

October 15. With the exception of a troublesome cystitis, patient is doing well.

November 2. Sat up for the first time. From now on she progressed steadily until her discharge from hospital, November 19, 1895. Button was not passed.

Patient presented herself for examination September, 1896. She has had no symptoms referable to the gall-bladder since she left the hospital; the button has never been recovered. At the time of its introduction the bladder was a large, capacious pouch, and it would more easily pass into that cavity than into the duodenum, but there is no evidence of its presence there, no tumor and no local pain.

Case II. Biliary Calculi. Operation. Cholecystostomy.

A. L., aged sixty-one; German; widow. Menstrual and maternal life have been normal, having had one child twenty-one years ago, after which the menopause was established.

About one year ago she began to suffer from pain of a dull, aching character in the right hypochondrium. There were times of acute exacerbations. This pain has continued more or less constant up to the present time, and she has failed in general health. For two months past she has had attacks of typical biliary colic, recurring as often as every second day. At times she is jaundiced, urine high-colored, and stools light color. With some of the attacks she has had a chill and a subsequent rise of temperature to 103° F. The duration of the colic is from one to several hours, its onset and termination being sudden. During the attack she sweats profusely and is doubled up with the intensity of the pain.

On admission she was slightly jaundiced. There was tenderness and muscular resistance over the region of the gall-bladder, but no tumor was distinctly felt.

Urine.—Sp. gr., 1028; dark amber color; trace of albumin and pus.

While under observation in the hospital, prior to operation, she had repeated attacks of colic of the character above described. There could be no doubt as to their genuineness, and she suffered intensely. Large doses of morphine alone would quiet them.

Her appearance is somewhat cachectic.

June 3. Cholecystostomy performed; ether narcosis; strict asepsis. Patient put in reversed Trendelenberg position, *i.e.*, with body on steep incline, the head being highest, so that intestines fell

down into the lower abdominal cavity. This position in no way inconvenienced the patient and greatly facilitated the operator. A curved incision, extending from the outer edge of the right rectus muscle to the mid-axillary line, about one inch and a half below the costal margin, was carried down through the peritoneum; length of incision, about seven inches. The distended gall-bladder immediately presented in the wound. It was about six inches in length, extended over two inches below the liver, and its fundus was the size of a billiard-ball. The colon and stomach were drawn well over to the left, and the liver up and to the right, thus exposing the bladder in its full length. A finger was passed along the neck of the bladder to the cystic duct, where a calculus could be felt. This was "milked" back into the bladder. The other ducts were then explored, but no calculus could be felt. An attempt was made to expose the head of the pancreas, a diagnosis of cancer in that organ having been made by one of the gentlemen who had seen the patient in consultation. This attempt was unsuccessful, however, owing to the excessive fat. An incision one inch and a half long was then made vertically through the fundus of the bladder, and about five ounces of normal bile evacuated.

A finger in the bladder extracted seven calculi, the largest the size of a large pea. The entrance to the cystic duct could not be made out. During this manipulation the peritoneal cavity was thoroughly protected from bile by means of pads and sponges. The opening in the bladder was then sutured up with a continuous silk suture. A second exploration of the ducts was then made from the outside of the bladder, and a calculus the size of a large pea felt in the common duct. A prolonged attempt was made to hold the calculus *in situ*, so that an incision could be made over the duct through which to extract it. This, however, was unsuccessful, and the bladder was again opened to approach it from that direction. During these manipulations the stone escaped from reach, and could not again be found, though a prolonged and thorough search was made. Either it had been crushed in the attempt to fix it, or else it was forced back into the hepatic duct, the transverse fissure of the liver being just above the point where the stone was first felt.

The edges of the opening in the bladder were then sutured with fine silk to the parietal peritoneum near the posterior end of the abdominal wound, and a drain of gauze left in it. The parietal wound

on either side of the bladder was sutured with one layer of silk-worm-gut.

Time of operation, one hour and a half. Patient in considerable shock at its completion.

The post-operative history was uneventful. She had no pain after first twenty-four hours, abdominal wound healed kindly, and at the end of three weeks she was sitting up, with only a small biliary fistula remaining. Her urine gradually became normal, and the stools progressively contained more bile, until at that time they were of normal color. From time to time small fragments of bile-stone came away with the bile.

In general condition there was a marked improvement, beginning only a few days after the operation.

September, 1896. Received a communication from the patient on her leaving the convalescent home of Isabella Heimath, in which after expressing gratitude for services rendered, she says: "I feel quite myself again."

Case III. Stone Impacted in the Common Duct. Cholecystectomy.

B. F., aged thirty-four; widow; housework; German.

Family History.—Both mother and father died of intestinal invagination.

Previous History.—Negative, except that she has always been troubled with constipation.

Her present trouble began about five weeks previous to her admission, December 27, 1893. It commenced with pain referred to the centre of the sternum, severe in character, and lasting for about two days. It was accompanied by chills, fever, sweating, and headache. The fæces were clay-colored. Since then she has had several such attacks, varying in severity. Two weeks ago she noticed for the first time that her skin was jaundiced. Her last attack occurred one week ago. Since then she has had some pain in the right side at the lower border of the ribs, radiating downward.

On admission to the hospital the patient exhibits a jaundiced skin, covered with scratch marks. Her tongue is thickly coated with a white fur. On the right side, below the free margin of the ribs, in the mammillary line, is a mass, which, to the palpating fingers, feels ense. It seems to be just at the lower margin of the liver, which is enlarged. It appears to be the dilated fundus of the gall-bladder. Manipulation of the tumor causes some pain.

Examination of the urine shows the presence of bile-pigment. It is quite dark in color.

From the history of the case, and from the conditions present on the right side, it would seem to be one of stone impacted in the common bile-duct. Her recurring attacks apparently indicate that the stone has not passed into the intestine ; or that it has succeeded in doing so, and has been followed by others. We therefore expect that this attack will be followed by others, and that operative interference, namely, the removal of the obstructing stone from the common duct, is the only treatment that will be of lasting value to her.

December 29. The mass on the right side seems to be diminishing somewhat in size. It is still tender. Her jaundice is lessening. Temperature averages 102–3° F. ; pulse, 100.

January 8. Patient shows improvement in every way. She is evidently recovering from present attack.

January 22, 1894. Her jaundice has disappeared. The fundus of the gall-bladder can still be indistinctly made out. The tenderness over it is not noticeable. She is discharged, to return at the next attack.

March 12. Patient returns saying that five days ago she was seized with an attack similar to the one above described. Pain in right hypochondriac region accompanied by chills, fever, and sweating. Clay-colored stools and bile-stained urine. Her jaundice also reappeared, and has been increasing.

Upon re-admission examination showed skin and conjunctivæ jaundiced. The edge of the liver can be felt about one inch below the costal margin, and projecting from its under-surface an oval, tense, tender tumor, apparently a dilated gall-bladder, can be palpated. Her dejecta are clay-colored, urine dark in color and contains bile-pigment.

The removal of the obstructing body seemed to be indicated, and patient was prepared for operation.

Operation.—Ether narcosis. Patient in reversed Trendelenberg position, angle of inclination being about sixty degrees. All antiseptic precautions were observed. An incision eight inches in length, running parallel to the lower border of the ribs on the right side and about one-half inch below them, its centre over the most prominent part of the tumor. The tissues were divided in turn down to the peritoneum ; when this was opened, the lower border of the liver

presented itself. Adherent to it for some distance was found to be a process of the omentum. On inspection no gall-bladder or resembling structure could be seen. In the position of the normal gall-bladder, however, a mass could be indistinctly made out, by the examining finger, lying directly under the liver, composed apparently only of omentum and adherent structures. On careful, blunt dissection with the fingers, this mass defined itself more clearly. Several rather firm adhesions were separated from it, and an adherent process of omentum, which was seen to run directly into the mass, was ligated off with medium catgut. The mass proved to be the gall-bladder itself. The walls were considerably thickened and contracted. The process of omentum, after reaching out for the inflamed gall-bladder, had evidently surrounded it on all sides, and contracted firm adhesions to it throughout. During the manipulation necessary for its liberation the gall-bladder was opened, liberating twelve to eighteen brown-colored, smooth, facetted stones, varying in size from the head of a pin to that of a small dice. It was impossible to discover any communication between the interior of the gall-bladder and the ducts. After carefully freeing the gall-bladder on all sides from its surrounding adhesions, it was cut off at its termination in the cystic duct below and removed. In doing so, several bleeding vessels in the lower part of the wound were clamped. The clamps were left on for forty-eight hours, the vessels being at too great a depth in the wound to be tied with safety. The exploring finger, passed along the common bile-duct, failed to detect the presence of any stone. A drainage-tube of fair size, surrounded with iodoform-gauze, was now introduced into the very bottom of the wound over the orifice of the cystic duct, and kept in position by means of a packing of iodoform-gauze. The wound was now partially approximated at each extremity by means of silk-worm-gut sutures ; a copious aseptic dressing applied. Patient returned to ward in good condition.

Patient made a good recovery from operation. For the few days following, bile passed out of wound at the rate of eight to ten ounces daily. The amount then steadily decreased. On the third day after, her jaundice was markedly less ; her fæces began to regain their normal color. She is still constipated. The edges of the wound that had been approximated united by first intention. Her general condition improved almost at once. She had no constitutional symptoms. Chills, fever, and sweating ceased. Patient made

an uninterrupted recovery. One month after the operation, bile had completely disappeared from the wound, and patient sat up out of bed. Discharged cured on May 19, 1894, with small sinus.

The gall-bladder in this case was apparently in so degenerate a condition that it was considered best to remove it, after an effort to establish its communication with the ducts had failed ; the stone which had obstructed the common duct had evidently passed.

Case IV. Cholecystotomy for Biliary Calculi.

J. R., aged thirty-six ; housewife.

Previous History.—One year ago had an attack of sharp colicky pain, referred to a point just below sternum, lasting about five days. Stools at this time clay-colored, but she had no jaundice and no constitutional symptoms. Bowels always constipated. There is no evidence of syphilis and no alcoholic habit. Otherwise she has enjoyed good health until her present illness, which began September 13, 1895, one month previous to admission, with sudden colicky pain in the region of the gall-bladder, accompanied by fever, sweating, and occasional vomiting. Stools clay-colored. This attack lasted one week, and then partially subsided. She was admitted to the hospital September 21, and shortly afterward became jaundiced for the first time. Since her admission she has had several attacks of biliary colic, lasting from one to two days, temperature during these attacks rising to 106° F.

On account of the severity and frequency of these attacks, and the fact that all medical treatment failed to afford relief, operation was advised with the object of removing any calculi present in the gall-bladder, or any obstruction that might possibly exist in the cystic duct.

Patient was admitted to the surgical division October 14. Physical examination made then proved entirely negative.

October 16. *Operation.* — Ether anæsthesia. Thorough antiseptic precautions. Patient in reversed Trendelenberg position, angle of trunk about sixty-five degrees. A curvilinear incision of eight inches was made one inch and a half below, and along the border of the right ribs. On opening peritoneal cavity the right lobe of the liver presented in the wound. This was drawn up by an assistant. Gall-bladder was exposed. It was very much atrophied, with thickened walls, adherent on its under-surface to omentum. Several small calculi, the size of pease, could be felt within it. The omentum

adherent on its under-surface was taken as a guide in searching for cystic and common ducts. These were readily discovered and examined with orderly precision, but there was no evidence of any calculus in them, although the cystic duct appeared somewhat thickened, as though the result of some recent inflammation. It was decided to remove the few small calculi in the gall-bladder, with the idea of preventing any further attacks of biliary colic. Gall-bladder was drawn down as far as possible into the wound, general cavity of the peritoneum being protected by pads and sponges, and incised. Five small calculi, the size of small pease, were removed by a scoop. They were of a light yellow color and not facetted. Gall-bladder was now closed by interrupted sutures of fine silk. On account of the possibility of there being some leakage, a drain of iodoform-gauze was passed down to gall-bladder. Wound was then closed completely by means of interrupted sutures of silk-worm-gut, a small space being left for the drain.

Patient recovered well from operation. On the third day after, she was much improved. Her bowels moved as the result of catharsis; movements were normal. Wound was dressed on the fifth day and found to be in good condition. The stitches with gauze-packing were removed on the tenth day; fifteen days after operation wound was found to be infected, apparently with a stitch abscess. It was necessary to irrigate wound daily with bichloride, and it was not until two weeks later, one month after operation, that wound was perfectly clean. With the exception of this delay patient has gained in every way. She has been free from pain, and is better than in months before. Six weeks after the operation she sat up for the first time, and was subsequently discharged cured.

II.

COLD TUB-BATHING IN ENTERIC FEVER.

By W. Gilman Thompson, M.D.

The following discussion is based upon a personal experience with upward of two hundred and fifty cases of enteric fever, seen at the Presbyterian Hospital and elsewhere, and treated by the Brand method of cold tub-bathing.

There is nothing new in the treatment of enteric fever by cold baths, it having been practised in England by Currie a century ago, and advocated by Brand in Germany for nearly thirty-five years, yet in this country the method, as employed by the latter clinician, has not, until quite recent years, received the attention it deserves, although almost every practitioner at times uses cold in some of its forms of application, either as a wet-pack, the cold sponge-bath, Leiter coil, the bed-douche, etc.

In the majority of cases upon the study of which this article is composed, the treatment has been carried out in detail as follows: A large copper bath-tub is placed upon rollers at an elevation of one foot from the floor, a convenient height for the nurses who have to stoop over it, and not so high as to interfere with the easy transfer of the patient into and out of the water. The tub is filled from a neighboring faucet by means of a hose, through which the water is syphoned out again whenever it is desired to change it for a fresh supply—practically after each half dozen baths. A rubber cushion is placed in the bottom of the tub, for the protection of the buttocks if needed. Sufficient water should be used to entirely submerge the patient, with the exception of the head, which is supported upon a rest. The tub should be deep enough and wide enough to admit of readily turning the patient, or of floating him over from side to side, so that different parts of the body may be rubbed in succession. The dimensions of the tub are: Length, 7 feet; width, 24½ inches; depth, 18 inches; height above floor, 1 foot.

The patient, covered by a loin cloth, is lowered by two attendants into water at 70° F., whenever his rectal temperature reaches 102.5° F. and is immersed for fifteen minutes, during which entire time he is vigorously rubbed by the nurses. A cloth, wet with iced water, is kept upon his head. He is then replaced upon the bed which has meantime been prepared with a large rubber sheet, covered by a blanket. He is folded in a sheet, is quickly rubbed dry, covered with a blanket, is given a glass of hot milk, gruel, or malted milk, and is finally left to rest, often to dose for an hour or two. In most cases it is desirable to give half an ounce of whiskey shortly before the bath. No other stimulants are given, and the mild cases do not require any at all. The patient's temperature may be taken immediately after the bath, but it is not necessary to do so for an hour, for it often continues falling during that time, and longer. If, at the expiration of three hours, the temperature is again above 102.5° F., another bath is given. In severe cases patients are awakened and bathed at night at the same interval, although some discretion must be exercised to see that they do not become exhausted from lack of sleep, and it is sometimes better to omit a bath in the early morning hours, to allow a restless patient to gain sleep, which the dread of interruption may otherwise deprive him of. Patients naturally complain more of the baths given at this time of the day than of any others.

Great stress should be laid upon the importance of the rubbing, for reasons to be presently given. In fact, if the treatment were designated as that by "rubbing" as well as by "tubbing," it would be no exaggeration. The friction should be performed by two nurses, each using both hands. It must be continuous, but gentle; a broad, quick sweep of the hand accomplishes the best results; too vigorous rubbing makes the skin too sore for future baths, especially if the chest or other parts of the body be hairy. When there is a thick, long growth of such hair, it may be cut short, otherwise the hair-follicles become reddened, swollen, and painful if many baths are required. One attendant should rub the back and chest, while the other rubs the legs; or the back, arms, and sides are to be rubbed in quick succession, the patient being turned occasionally from side to side, to give access to all parts of the body. The abdomen should be but gently rubbed, if at all.

The object of the friction is primarily to apply a mechanical

stimulus to the cutaneous surface over a large area, thereby reflexly stimulating the entire nervous system, and also the vaso-dilator nerves of the periphery, which allow of the determination of increased supply of blood to the surface to be cooled by the water. Secondly it diminishes the shivering and discomfort which constitute so pronounced a feature without it. Finally, as aptly said by a recent writer, it serves to pass the patient's time and divert his attention from the cold.

The shivering is naturally the patient's chief complaint, and in a personal experience in the tub, when suffering from the disease several years ago, I found it became much lessened by taking the alcoholic stimulant long enough before the bath to admit of its absorption and diffusion through the circulation before the bath was given, *i.e.*, twenty or thirty minutes before entering the tub. If given immediately before, it is not absorbed in time to do good. Rubbing the back first, along the spinal column, lessens the feeling of cold. It is important to begin the rubbing the instant the patient is immersed. If one attendant leaves to prepare the bed or perform other duty, the patient's discomfort is at once increased. Again, no time should be lost in drying off the patient upon his removal from the bath.

It is desirable to have the temperature of the water accurately taken. It is surprising, when one tries it, to observe what a difference in discomfort is experienced in a bath only three or four degrees lower in temperature than the prescribed limit for which one soon acquires tolerance. It is a matter of passing interest to note that the temperature of the water is usually elevated one degree during the bath. This is in part due to absorption of heat from the patient's body, and in part, no doubt, to the vigorous friction imparted to the water. When one recollects that there are at least twenty cubic feet of water in the tub, it is evident that considerable kinetic energy is expended in raising this volume of fluid through one degree Fahrenheit.

Immediate quiet should be ensured the patient after the bath. A noisy attendant, fussing about the room, seeking to restore order, will prevent the sleep which often succeeds a bath until the desire for it has passed. Patients usually wish to micturate very soon after leaving the tub, but I have never known of their doing so while in the bath, nor have I met with but a single instance of a patient defecating while there, and he was having involuntary evacua-

tions. As a rule, much less alcoholic stimulation is required by patients undergoing the tubbing treatment than is commonly used —which is an obvious advantage.

The intelligent application of the cold-tubbing treatment depends upon a proper conception of the theory of its use. It is in nowise curative in the sense in which medicinal remedies are employed, but acts through applying a strong double stimulus, mechanical and thermic, to the central nervous system, thereby better enabling it to withstand the depressing influence of the typhoid poison. Enteric fever is a disease caused by the absorption and distribution throughout the body of a toxin produced by the action of germs definitely localized within a comparatively small area. One of the most striking effects of this toxin is to cause elevation of body temperature, but another equally dangerous effect is the depression of the central nervous system. Of all fevers, enteric fever is pre-eminently characterized by such depression, as shown by the delirium, stupor, tremor, subsultus, asthenia, etc.

The cold plunge-bath acts upon this fever in three ways : First, it not only reduces the temperature by abstraction of body-heat, but, secondly, by the suddenness of the shock of cold, and, thirdly, by the constant friction, it applies a stimulus to the nervous system which enables it to withstand to a remarkable degree the advance of the disease. The influence of the baths upon the nervous system directly, and indirectly upon the patient's nutrition, is of even more importance than mere reduction of temperature. There are many cases in which the latter effect is comparatively slight, the temperature not falling more than 0.5° or 1° F. after the bath, yet delirium subsides, the patient's mental condition and digestion improve, tremor and subsultus disappear, the tongue becomes moist and clean, the pulse improves, the action of the bowels and of the urinary secretion become more nearly normal, while the strength and general nutrition are maintained in a manner which is surprising when this method of treatment is compared with the purely expectant plan.

The degree of reduction in temperature which the tub-baths produce varies greatly, as observed by the clinical thermometer. I have often found continued benefit from them in patients having temperatures above 104° F., which did not fall more than 0.5° or 1° F. after bathing, quite as much benefit indeed as in those whose

temperatures fluctuated three or more degrees as a result of the baths. The average reduction in temperature from a single bath is 2° or 2.5° F., but the reduction may amount to 3.5° or even 4° F. A careful comparison with the results of cold sponging shows an average difference of from 1° to 1.5° F. in favor of the tubbing.

When regarded in the light of a stimulus to the nervous system, the tubbing treatment seems a rational one, but its limitations should be kept clearly in mind. It, of course, can neutralize none of the toxin, nor does it aid in its elimination, except possibly quite indirectly by remote effect upon the kidneys. It does not reach the deeply seated ulcers, and can only influence them indirectly through maintenance of better general nutrition. It does not cut short the disease nor does it prevent relapses in many cases. On the other hand, it does not interfere with the simultaneous employment of any other treatment, such as that by laxatives and intestinal antiseptics, although no treatment other than bathing and dieting was used in any of the cases upon which this discussion is based. What it does do emphatically is: it keeps the patient's mind clear, the tongue moist, and the digestive organs in normal condition. Bed-sores are quite unknown. Previously existing bronchitis and delirium frequently disappear after a few baths. Tympanites becomes a rarity. Throughout the entire conduct of the case one feels that something definite and rational is being done for the patient, and one almost never sees in those who come early under treatment, within the first week or even ten days of illness, the typical typhoid condition of Louis—the low muttering delirium, the parched, fissured tongue, making articulation and deglutition difficult, or impossible, the subsultus, involuntary evacuations, rapidly progressing emaciation, complete asthenia, etc.

When I first undertook the Brand method of treatment, I hesitated to apply it in many cases in which severe complications already existed, especially intestinal hemorrhage, and also in cases complicated by pregnancy or intercurrent menstruation, but the only complications which in the light of further experience seem to me to forbid its use, are severe lobar pneumonia, cardiac failure, intestinal perforation, and hemorrhage. With regard to the latter, however, it is quite safe and desirable to resume the baths after hemorrhage, provided this symptom has ceased and the patient has had at least one normal stool. I have used the treatment in successful cases in

each month of pregnancy up to the sixth, and I have never seen any ill effects whatever follow bathing women during their menstruation.

I shall not insist upon the value of comparative mortality statistics. I will give but few figures, and in doing so, must protest against their being possibly misjudged. Nothing is more fallacious than mortality data hastily compiled from some new method of treatment of, say, one or two hundred cases of such a disease as enteric fever. When the cases reach the thousands it is another matter, but everyone who has seen much of that disease knows how its severity varies from year to year, and knows how many mild cases recover without treatment of any description beyond a fluid diet and an occasional sponge-bath. As seen in the hospitals in this city, thirty or forty cases may often run their course without a death, to be followed the next month by half a dozen fatal cases. One autumn the disease will be largely characterized by excessive fatality from intestinal hemorrhage, and the next, perhaps, by its absence, but by the greater prevalence of catarrhal complications, pneumonia, bronchitis, otitis, etc. Moreover, the fever varies greatly in its characteristics and severity in different localities in this country. This fact has been admirably demonstrated by Dr. W. W. Johnston,[1] of Washington, in a paper read a few years ago before the Association of American Physicians, in which he summarized the data received in answer to questions directed to three hundred and fifty physicians along our Atlantic and Gulf seaboards, showing the great variation in type of the disease as it prevails in the coast States. It is well known how much milder enteric fever usually is in such cities as Denver, or Cheyenne, and in fact in many of the States west of the Mississippi.

We do not get so great a reduction in mortality in this country as is claimed in Germany and France for the Brand system. It is true that many of the foreign statistics are derived from army hospital experience, where patients come early under treatment, whereas in our metropolitan hospitals the majority of patients, coming from the tenement-house class, do not seek hospital treatment until they are seriously ill, often toward the end of the second or

[1] On the Geographical Distribution of Typhoid Fever in the United States.—Trans. Assoc. Amer. Phys., Vol. III., p. 8.

third week of the disease, and they have been very poorly cared for. However, such statistics as have been already published in this country upon a fairly large scale are very gratifying to adherents of the Brand system. Osler gives the recent mortality of enteric fever at the Johns Hopkins Hospital treated by the cold-tubbing system as 7.1 per cent., and Wilson has lately reported five hundred and twenty-four cases similarly treated at the German Hospital, in Philadelphia, up to January 1, 1896, with only thirty-eight deaths, a mortality of 7.25 per cent. Among a series of eighty-nine cases treated at that institution from January 1, 1895, to January 1, 1896, but a single death occurred, whereas prior to the introduction of this treatment the mortality was 18.5 per cent. Forty-eight cases which I reported[1] prior to January 1, 1892, treated mainly at the New York Hospital, had a mortality of 6.5 per cent. As already said, such a few cases are not very impressive by themselves, but I add them to the accumulating reports of others. After all, a visit to an hospital ward containing a dozen or more cases of enteric fever all under the Brand system of treatment, is far more convincing than hundreds of figures, with the added uncertainty of selection of cases and varying types in the disease.

At the Presbyterian Hospital, where I introduced the tubbing treatment in 1890, two hundred and eighty-four cases of enteric fever have been received in the six years since that date, with a total mortality under all forms of treatment, of 14.79 per cent. Owing to the fact that these patients were treated by several different visiting physicians, as well as owing to other circumstances, but one hundred and ninety-three of them received cold tub-baths as above described. Among this class, moreover, were included many practically hopeless cases, so that the death-rate among them all is nearly as great as the general death-rate for all cases admitted. One great objection, made by the opponents of the treatment under discussion, is that the published data are derived from selected cases. I see no other way to get at the root of the matter in justice to both sides. A patient is brought by the ambulance into the hospital at the end of the third week of the disease, moribund, with a temperature of 107° F. He is given two tub-baths, in the faint hope of saving him, but dies within eighteen hours. Surely it is more misleading to record such a case among the mortality statistics of those

[1] International Clinics, January, 1892.

treated by the Brand system, the Woodbridge system, or any other system, than to leave it out of count altogether. Even cold bathing works no miracles. Another patient is received comatose, with the history of having had several hemorrhages a few days before, or still another is received with extensive lobar pneumonia as a complication, and a temperature of 105.2° F. Both are bathed, but with no improvement, and death shortly follows. Are such cases to be included in "tubbing" mortality statistics? If so, it must be frankly admitted that the death-rate under this treatment at the Presbyterian Hospital has not been lowered more than one-fourth of one per cent. But if the moribund cases and those which had hemorrhage or pneumonia before admission be deducted, then the hospital mortality corresponds with that now generally reported in this country, *i.e.*, between seven and eight per cent., for the cold-tubbing treatment. A series of sixty-three unselected cases lately treated here gave a mortality of 7.75 per cent. Only one of them was received during the first week of the disease. Against this may be cited the mortality of the two hundred and fifty cases treated by all other methods at this hospital, from 1882 to 1890, which was 16.1 per cent.

Dr. Thornley has elsewhere given (see Article 16) a valuable compilation of data of enteric fever cases treated at the Presbyterian Hospital[1] by both forms of cold bathing, *i.e.*, cold sponging and tubbing. From these I have selected the following three groups of cases that were tubbed alone and which illustrate in striking manner the importance of beginning the cold-bathing treatment early, if it is to be successfully prosecuted. It is of comparatively little avail when commenced in the third week of the disease.

(A.) Of the twenty-five cases received before the end of the first week, two died—a mortality of eight per cent. Among those who recovered there was a notable absence of complications throughout the disease, only three serious ones developing. These were: One case of hemorrhage, one of ischio-rectal abscess with slight hemorrhage, and one of cardiac dilatation. One other patient developed concurrent malaria, the germs being found in the blood. There were no relapses, and but one recrudescence was observed.

(B.) Eighty-two cases were received in the second week of the disease, among which there were eight deaths, or 9.8 per cent.

[1] It will be noted that Dr. Thornley's data extend from January 17, 1893, whereas the statistics on the previous page include three additional years—from 1890.

mortality. One of these cases, however, had but two baths, and therefore does not fairly belong to bathing statistics. Without this case the mortality would be 8.6 per cent.

The causes of the eight deaths were :

1. Hemorrhage.
2. Broncho-pneumonia, alcoholism.
3. Broncho-pneumonia, suppurative pharyngitis.
4. Broncho-pneumonia (two baths only).
5. Asthenia.
6. Cerebral embolism.
7. Lobar pneumonia.
8. Lobar pneumonia.

Several of these cases were very ill on admission, the pneumonia being already developed.

In this group there were four relapses.

(C.) Twenty-five cases were received in the third week of the disease, of which four died, a mortality of sixteen per cent. The causes of death were :

1. Hemorrhage.
2. Hemorrhage.
3. Relapse and perforation.
4. Broncho-pneumonia.

The average duration of the cases in this group was seven weeks.

Among the total number of cases treated by the tub baths alone were nine patients who recovered from intestinal hemorrhage.

The complications which occurred in cases received after the first week of the disease were as follows : 1 general papular eczema ; 3 furunculosis ; 1 ischio-rectal abscess ; 1 cellulitis and broncho-pneumonia ; 1 rectal ulcer ; 3 phlebitis ; 1 pneumonia, pleurisy with effusion ; 1 broncho-pneumonia, alcoholism, and phlebitis ; 2 neuritis. All recovered. Besides these were four cases of pre-existing disease, viz.: 1 aneurism ; 1 chronic endocarditis ; 2 malaria.

A word must be said in regard to the objections which have been advanced against the Brand bathing. They have been largely based upon theoretical grounds, and have come in great part from those who have either had no practical experience with it, or who have tried it in a few unfavorable cases, and not finding it a "cure," have abandoned its use.

1. The tubbing is objected to as cruel, even barbarous. It is

certainly extremely uncomfortable to be taken from a warm bed under any circumstances of ill-health and suddenly plunged into cold water, but the treatment has its compensations, for if the muscular fever pains are severe, they are almost entirely relieved, for an hour or two at least, after the bath. The patient also feels less languid, as if a tonic had been administered, and recognizes the improvement in appetite and digestion which often follows. Most patients, indeed, become so used to the bathing after a half-dozen tubbings, that they object to it but little. I have not among two hundred and fifty cases been obliged to discontinue the baths more than four times on account of the serious objection of the patient, and in each instance the patient was a highly neurotic subject, objecting systematically to everything done, and offering even more resistance to the sponge-bath or Leiter coil. If the patient is a very nervous subject the initial bath may be given at 85° or even 90° F., and a little tact and persuasion will usually enable the treatment to be continued at 70° or 75° F., without further trouble. I have often asked patients during convalescence how they regarded the treatment, and have been almost uniformly told, even if they did not claim to enjoy it, that they realized its benefits at the time, and found it by no means cruel or intolerable. Upon more than one occasion patients have asked to be tubbed more often, and I have once or twice known them to voluntarily jump into the tub when the nurse's back was momentarily turned. I have recently questioned ten intelligent patients particularly in regard to this matter, one of them being himself a well-known physician. They had all been given alcohol sponge-baths at this hospital while their temperature was a little below 102.5° F., and tub-baths whenever it exceeded that limit. All but one declared quite positively that they had on the whole found the tubbing no worse than the sponging, while several distinctly preferred the former. One, however, objected decidedly to both.

The shivering, which from the patient's stand-point is undoubtedly the greatest drawback to the treatment, is by no means always so bad from the subjective as it appears from the objective point of view. It may commence in the tub and may last for fifteen minutes or even half an hour after the patient's removal. It is usually controlled by a hot drink of some sort, prompt and thorough drying of the body, and, if necessary, hot-water bottles applied to the feet. Should these measures fail, a small hypodermic injection of morphine,

given fifteen minutes before the bath, or a dose of the aromatic spirits of ammonia, or of chloroform mixture after the bath, will control the shivering. It is often prevented by reducing the duration of the baths for a time from fifteen minutes to ten. Many patients who shiver considerably in their first few baths subsequently acquire tolerance and suffer much less from this uncomfortable feeling.

2. It has been objected, upon purely theoretical grounds, that the cold bath would drive the blood from the periphery to produce visceral engorgement and increase the liability to hemorrhage. This objection is not sustained by the facts, and when the friction is properly applied and maintained the peripheral vessels are kept dilated as shown by the ruddy redness of the surface of the body while in the water. The cases above reported show no increase in the frequency of this symptom when compared with other methods of treatment.

3. It is objected that relapses are more common among patients who are bathed than among those who are not. Relapses occurred in twenty-six of one hundred and ninety-three patients tubbed at the Presbyterian Hospital, or about 13.5 per cent. This is a large percentage of relapses, in fact two per cent. larger than the proportion when estimated for the total number of two hundred and eighty-four cases treated at that institution by all methods during the same period of time. However, many of the patients who were not bathed died during the disease and obviously could not relapse. It is therefore again somewhat misleading to quote data in that manner, but the fact remains that very many of the bathed cases do have mild relapses. Death from relapse in enteric fever is comparatively infrequent at any time, and it is certainly preferable to run that small risk if the disease can be rendered milder throughout by treatment.

4. Another much less serious objection has been made upon the ground that the cold water is supposed to induce the complication of neuritis. I have quite as often seen that occur in patients not bathed as among those who were, and in any event it is usually of brief duration, and not of vital import. In our hospital tubbed cases it is present in only three per cent.

5. The tubbing is objected to because of the labor and expense involved. My own baths, taken at home, I estimated cost $2.50 each, including the expense of a portable tub and the additional nurses required by the treatment. In hospital service a bath cannot

be completed inside of half an hour, including the time spent in preparing the water and the bed, drying the patient, etc. For these purposes at least three nurses or orderlies are usually employed, two mainly for rubbing and lifting, and one for other details. This is equivalent to the work of one person for an hour and a half per bath, and a patient receiving eight baths in twenty-four hours would thus require the equivalent of twelve hours' continuous work, or a hard day's labor. The expense, therefore, practically amounts to the hospital having to supply that labor, or so much of it as would not be necessitated by the ordinary care of the patient. As the nurses are paid little or nothing, and the orderlies receive small wages, the expense to the institution is not so great as might at first appear. As the rubbing and lifting of many patients is exceedingly arduous labor, it is the custom in some institutions to employ outside assistants to perform that work alone and relieve the regular nurses somewhat.

The number of baths required is a matter of much interest and practical importance. The cases receiving the highest number of baths at this hospital were given tubbings as follows : 5 cases received from 60 to 76 each, and several others had 72, 78, 82, 90, 102, 124, 127, and 130, respectively. I have given even more in severe and protracted cases, although ordinarily not more than 15 to 20, or 25 baths are required for one case, although many receive between 40 and 50. To give 127 baths at the above estimate would consume 190.5 hours of labor, or nearly sixteen days of twelve hours each o continuous work. This is truly an arduous undertaking, but a typhoid-fever patient should have at least two good nurses for day and night work, no matter what treatment is employed, and in private practice the additional mechanical labor demanded for tubbing can be in part supplied by less expensive helpers, provided they are properly supervised.

The question of expense must in any case be compared with the results attainable. If it can be shown that in a given instance a man's chances of recovery are reduced from between fourteen and eighteen per cent. to seven or eight per cent., but few would hesitate over the investment—even in these hard times. The accumulating data of experience in many countries make this opportunity no longer a chance but a certainty in cases brought under treatment before the eighth or even tenth day of illness.

The conclusions derived from the observation of the foregoing cases are summarized as follows :

1. Cold tub-bathing does not ordinarily shorten the duration of enteric fever.

2. It does not prevent the occurrence of at least as many relapses as may take place without it.

3. It does not prevent the occurrence of many of the ordinary complications of the disease, most of which, however, are much less severe than those that often are present without it.

4. It does not in any manner preclude the simultaneous use of the intestinal antiseptic, or any other recognized method of treatment.

5. It may be safely employed in all cases excepting those actually having intestinal hemorrhage or severe pneumonia at the time, not even early pregnancy or intercurrent menstruation being contra-indications for its use.

6. It is a rational plan of treatment directed toward the support of the nervous system by the double stimulus of cutaneous friction and shock of sudden cold, and as such it is particularly useful in preventing those symptoms which result from the overwhelming of the nervous system by the toxin of the disease. Furthermore, it so regulates the metabolic processes of the body as to increase its resistance to the inroads of fever, and less alcoholic stimulation is required than is often given in other methods of treatment.

7. When patients come under the tubbing treatment within the first week of illness it offers the almost certain prospect of the disease running a mild course, free from the graver complications common under expectant and other treatment, and it reduces the mortality of many of the severer cases by approximately one-half.

The most striking features, which are so often commented upon by those visiting an enteric fever ward where a series of patients are under the tubbing treatment are their remarkably good facies, mental condition, and nutrition. Surely it is a decided gain to be able to accomplish these results for the patient, if nothing more, in so complex and protracted a disease, and when, in addition, a substantial reduction in mortality is obtainable, the benefits must outweigh the objections and disagreeable features, at least, until some better method, perhaps an ideal intestinal antiseptic, or an immunizing serum is discovered.

III.

TWO CASES OF PERFORATING GASTRIC ULCER — OPERATION—RECOVERY.

By Andrew J. McCosh, M.D.

In recent years considerable attention has been devoted to the surgical treatment of gastric ulcers, not alone in cases of perforation, but also when persistent pain and hemorrhage have baffled medical treatment. In the latter class of cases the possibility of failure to find the ulcer must always be considered before gastrotomy is recommended. In the former class, however, no question can arise as to the propriety of surgical interference. Gastric ulcer is a common disease, and perforation takes place in at least ten per cent. of the cases. (Comte says fourteen per cent.) Without surgical treatment more than ninety-five per cent. of these patients must die. In an admirable article (*Medical News*, 1896) Drs. R. F. Weir and E. M. Foote have tabulated seventy-eight cases treated by operation (where perforation into the general peritoneal cavity had occurred), with a mortality of seventy-one per cent. This mortality, however, would undoubtedly be much reduced could the patients fall into the hands of the surgeon soon after the perforation. Take for example (Weir and Foote's tables) the twenty-three cases where operation was done within twelve hours, and there were fourteen recoveries, a mortality of thirty-nine per cent.

The results of operative interference in cases where a localized intraperitoneal abscess has formed without rupture into the general cavity must be still more favorable. In such patients an early diagnosis and an early operation are of the utmost importance. It is true that often the diagnosis is obscure, but even in doubtful cases the symptoms are generally such as to warrant an exploratory operation. The walls of such abscesses vary greatly in strength, and no one can predict how soon rupture will take place. This difference in strength is well illustrated in these two cases. In the first, the

abscess had evidently existed for at least four weeks, and in spite of cathartics, lavage, and vomiting, its walls had not yielded. At the operation this was explained by the large amount of inflammatory exudate surrounding the abscess cavity. In the second case, the walls of the abscess resisted rupture for a few days only, and then apparently allowed a small amount of the contents to escape into the general peritoneal cavity. This also was explained at the operation by the feeble agglutination of the tissues forming the wall of the abscess, and by the absence of any appreciable amount of lymph.

Case I. E. R., aged thirty-five; widow; never pregnant; absence of rheumatic, syphilitic, malarial, and alcoholic history. Has never suffered from typhoid, dysentery, or any of the contagious diseases. When twenty-one years of age she weighed one hundred and seventy pounds. For years habitual constipation necessitated the use of cathartics every second or third day. During the past three or four years occasional attacks of severe constipation, when sometimes for weeks there would be no movement of the bowels. For the past eighteen months she has suffered from disturbances of digestion, occasional nausea and vomiting, with frequent severe colicky pains, and some abdominal distention. Considerable and progressive loss of flesh and strength. In September weight one hundred and fourteen pounds. On October 24, 1895, attack of vomiting and nausea, continuing for two or three days, with abdominal pain, especially in the epigastric region. In spite of cathartics, persistence of obstinate constipation, so that until November 6 only one small movement of the bowels could be obtained. Abdominal distress increased and but little nourishment could be taken. On November 4 the epigastric pain had become so severe that Dr. R. Milbank was called in consultation by her physician. At that time the abdomen was considerably distended, the muscles rigid, and there was general tenderness, but more marked in the epigastric region. Dr. Milbank made the diagnosis of either perforating gastric ulcer, or partial intestinal obstruction due to a band, and advised laparotomy. He asked me to see the case on November 5, and we agreed that the probable diagnosis was an ulcer of the stomach, which had either partially perforated, with a resultive local peritonitis, or had entirely perforated, with a resulting encapsulated abscess. Her temperature then was 101° F.; pulse, 100; respiration, 26. She complained of severe pain in the epigastric region, with exquisite

tenderness, the most tender point being a little below and an inch to the left of the ensiform cartilage, and in this region an indistinct mass could be felt, though on account of the tenderness it was impossible to determine its nature or extent. Consent was not given to an operation. Between November 6 and 24 the patient was seen by a number of physicians, who were in doubt as to the nature of the trouble, and advised against immediate operative interference. During this time the epigastric pain continued, the abdomen remained moderately hard and tympanitic, nausea and vomiting persisted, but little nourishment could be taken, and there was a steady loss of flesh and strength. The bowels were moved by high oil enemata and *lavage* was employed. There was continued fever; the morning temperature was 99½ to 100° F., the evening 101 to 102° F., occasionally rising as high as 104°; pulse, 110 to 130. She was afterward admitted to the medical division of the hospital, when the necessity of operation was urged by Dr. F. C. Kinnicutt. On November 25 the patient was admitted to the surgical division. Abdomen hard and moderately tympanitic. Epigastric region very sensitive to pressure. Projecting from under the free border of the left costal cartilages, toward the ensiform cartilage, could be felt a resistance, and an indistinct mass which seemed immovable and apparently attached to the stomach. Temperature, 102½° F.; pulse, 110. In spite of adverse opinions the case was diagnosed as one of perforating ulcer of the stomach with an encapsulated intraperitoneal abscess. The history, the acute epigastric pain and tenderness, with the indistinct mass in this region, seemed to point to this conclusion. Another important sign was, that the pulsation of the aorta seemed to be transmitted directly to the finger, when gently placed on the surface of the abdomen just below the tip of the sternum. The impression was given that a solid body had taken the place of the hollow viscera, that it rested on the aorta, and was adherent to the abdominal wall. This peculiar pulsation is often a sign of great value in cases where there is a question in diagnosis between cancer and tumors of an inflammatory origin.

November 26. *Operation.*—Chloroform. Vertical median incision, three and one-half inches downward from tip of ensiform cartilage. When the peritoneum was reached, it was found firmly adherent to structures beneath. In the upper three-fourths of the incision was found the adherent left lobe of the liver, which was

markedly congested. In the lower fourth was found the stomach adherent to the abdominal wall and to the liver above. This agglutination of stomach and liver formed the superior wall of the abscess. The liver was separated and pushed upward, and the stomach downwards. Between these organs there was a considerable mass of inflammatory exudate. Through this material the finger was gently pushed, and at the depth of two inches a cavity was entered which contained about two ounces of frothy, purulent fluid, particles of coagulated milk, and remains of food. At the bottom of this cavity, at a point three and one-half inches below the skin, was felt an opening in the wall of the stomach, which admitted the tip of the index-finger. The opening was oval in shape, with indurated and comparatively smooth edges. For a considerable distance around this opening the wall of the stomach was thickened, and very markedly so, for a space the size of a silver dollar; its thickness at the edges of the opening being at least one-third of an inch. This opening was situated in the lesser curvature, just anterior to the attachment of the anterior layer of the lesser omentum, and at a point about one-fourth of the distance from the cardiac to the pyloric orifices.

The abscess cavity was carefully cleansed, the edges of the opening in the stomach were thoroughly scraped with a scalpel and trimmed with the scissors. The opening was then closed by two rows of sutures. The first row consisted of uninterrupted catgut sutures passed through the serous and muscular coats, both of which were much infiltrated with inflammatory tissue. The second row consisted of interrupted silk sutures inserted through the serous coat. The tissue was so friable that several of the sutures of each row tore out, and, consequently, it was necessary to introduce the needle at a considerable distance from the edge of the opening. After careful cleansing a strip of sterilized gauze was passed down to the line of suture and the end brought out through the abdominal wound, the remainder of which was closed by three rows of sutures. Moderate shock followed.

November 27. Patient complained of nausea and there was slight vomiting. Temperature, 100½° F.; pulse, 110.

December 1. External dressing changed; no sign of leakage. Temperature, 99½° F.; pulse, 110.

December 3. Gauze strip removed; no leakage. Temperature has not reached 100° F.

December 7. Attack of pleurisy with effusion on right side, continuing with considerable severity for ten days.

December 20. Sutures removed; gradual gain of strength; nausea disappearing and appetite returning; bowels moved freely.

December 25, 1896. Out of bed; fair appetite; progress very slow.

January 10. Considerable gain of strength; discharged.

October. Since discharge from hospital slow but progressive gain in flesh and strength. For the first six months appetite was very poor and digestion weak. For past three months, however, gain has been more rapid. Increase in weight since discharge from hospital, twenty pounds. General condition fair—no nausea or vomiting, but caution needed in the selection of her diet. No pain, and patient feels that she is slowly but steadily improving.

Case II. Miss A. B., aged twenty-one. Family and personal history good. Patient had always enjoyed excellent health until January, 1895, when she was ill for three weeks with an ulcer of the stomach, the symptoms being epigastric pain and vomiting. She experienced no further trouble and felt perfectly well until October 28, 1896, when she experienced a severe and sudden pain in the left side between the last rib and anterior-superior spine of the ilium. There was no vomiting. The pain disappeared in a few hours, but she continued to feel ill, and on November 4 she experienced another attack of pain just below the tip of the sternum. She consulted her physician, who ordered a blister and sent her home to rest. There was no vomiting, neither was there much tenderness. Her pain gradually increased and she could take no nourishment, although she did not vomit. Bowels had moved after castor oil. On November 7 she felt so ill that she sent for Dr. S. S. Graber, who found her with a temperature of 102½° F., a pulse of 110, a tender abdomen, especially in the epigastric region, embarrassed respiration, and slight cough. He made a diagnosis of probable perforating gastric ulcer, and advised immediate operation. She delayed, however, coming to the hospital till late in the following afternoon. During the day she vomited three times. She was admitted by ambulance on November 8, about 5 P.M. On examination respiration was 36, and shallow, temperature 103½° F.; pulse 125. There was marked cyanosis. Mind was clear. Tongue dry and coated. No appearance of anæmia. Heart displaced upward and outward, the apex being

in the third intercostal space outside the left nipple. The lungs showed evidences of general bronchitis, with probably an area of consolidation in the lower left lobe. Dulness over base of both lungs, but especially on left side, where it reached as high as the angle of the scapula. On auscultation over left lower lobe, voice and breathing exaggerated and slightly broncho-vesicular. On percussion over the front of the left chest from the nipple downward, a tympanitic note. Liver-dulness absent. Abdomen slightly distended, especially in epigastrium and left hypochondrium. Muscles rather rigid. General abdominal tenderness most marked in the epigastric region, and very acute an inch below the tip of the ensiform cartilage, at which point she located the pain.

Operation at 8 *P.M.*—Pulse 130, respiration much embarrassed and rapid. Chloroform. Median incision for four inches downward from tip of sternum. Stomach adherent to parietal peritoneum at middle of incision. Above this was seen a collection of fluid which proved to be a circumscribed intraperitoneal abscess. On incising the peritoneum which formed its roof, turbid yellow fluid spurted out with considerable force. The amount of fluid was estimated as about one quart. The superior wall of the abscess was formed by the liver and diaphragm, the inferior by adherent stomach and intestines. The cavity was rapidly sponged and the stomach drawn out of the wound. A perforation was seen in the lesser curvature half way between the cardiac orifice and pylorus. The opening was circular, an eighth of an inch in diameter, with thickened, comparatively smooth, edges. These were pared by removing a narrow strip with a fine scalpel. The opening was closed by two rows of silk sutures, the first interrupted through the muscular and serous coats, and outer continuous Lembert through the serous coat alone. The stomach was sponged clean and replaced. The lower part of the incision opened into the general peritoneal cavity, which contained a considerable amount of turbid serum. The intestines were everywhere injected, distended, and streaked with lymph—a general septic peritonitis. Except around the stomach no adhesions were found. The general cavity was irrigated with quarts of hot-salt solution and four strips of gauze inserted for drainage. Into the abscess cavity above the stomach were inserted a rubber tube and strips of gauze. The edges of the wound were only partially approximated by silkworm-gut sutures, the escape of the intestines being prevented by

gauze passed under these sutures. Sterile dressing. During the irrigation the patient's condition improved and a considerable amount of fluid was left in the abdominal cavity. At the close of the operation the general condition was fully as good as at its commencement.

November 9. Condition improved; temperature, 101°–103° F.; pulse, 120 to 130; respiration, 36; vomited only once; bowels moved three times; nothing by stomach.

November 10. No vomiting; condition good; rectal alimentation.

November 11–14. Gradual improvement; temperature, 100°–101½° F.; pulse, 105 to 120; no vomiting; no pain; breathing difficult, 34 to 38. Evidences of broncho-pneumonia in both lungs; small amounts of water by mouth.

November 14–19. Temperature 101°–103° F.; pulse, 120; respiration, 34; considerable dyspnœa and cyanosis; no cough and no expectoration; condition less favorable; loss of strength; doubt as to cause of feeble heart's action and cyanosis, whether due to a broncho-pneumonia or to a subphrenic abscess. Area of flatness over sixth, seventh, eighth, and ninth ribs, just behind posterior axillary line.

November 20. Symptoms decidedly worse; pulse, 130; cyanosis more marked. At 11.30 A.M. a large hypodermic needle was plunged into the area of dulness between the eighth and ninth ribs, and at the depth of three inches it entered a cavity from which thick pus was drawn. Operation ordered for 3 P.M. At 12 M. a violent chill for twenty minutes; pulse became imperceptible at wrist, and patient very cyanotic. Following this the temperature rose to 106¾° F. For several hours patient was thought to be dying; pulse ranging above 160, and very thready. Operation was out of the question; active stimulation was employed.

November 21. Slight improvement; pulse, 140; temperature, 102°–103° F.; still marked cyanosis; not as yet in condition to take an anæsthetic.

November 22. Condition such as to warrant a rapid operation; chloroform; incision over ninth rib, just behind posterior axillary line; two inches of rib excised; incision deepened to diaphragm entering pleural cavity; incision made in diaphragm two inches long, and immediately followed by a gush of thick, very fetid, pus, mingled with broken-down tissue. The finger passed into a cavity

which was in the parenchyma of the spleen. The walls consisted of soft, pulpy, sloughing, splenic tissue. There was considerable hemorrhage, and, as the patient's condition was desperate, no attempt could be made to remove any of this sloughing and pulpified tissue. A drainage-tube and strips of iodoform-gauze were rapidly passed into the cavity, and a copious dressing applied.

Shock was extreme, but the patient rallied somewhat, and on the following day seemed a trifle better; temperature, 103°–104° F.; pulse, 140; respiration, 40.

November 24–30. Condition continued very critical; pulse, 140, very weak; temperature, 103°–104° F.; considerable dyspnœa and cyanosis; dressing needed to be changed every few hours, the discharge being very profuse and extremely fetid.

December 1–8. Gradual improvement; temperature, 101°–102½° F.; pulse, 120 to 130; discharge diminishing and less fetid; abscess irrigated twice daily; pleural cavity still open.

NOTE.—Subsequent death due to empyema, pneumonia, and pericarditis. Union in stomach wound perfect; ulcer cicatrized. No evidences of peritonitis.

IV.

RENAL TUBERCULOSIS.

By F. Tilden Brown, M.D.

The temporary presence of Koch's bacillus in the system does not mean the existence of that disease of which this micro-organism is the specific contagium, for we must believe that a great number of individuals remain immune to the varying numbers of this agent which reach the respiratory and alimentary tracts in the course of events incidental to the ordinary life during health. This presumption is supported by experimentation. On the other hand, there are supposedly those individuals whose tissues are inherently such that this moderate dosage is enough to institute more or less rapid establishment and dissemination of the disease and death. Between these two extremes exists probably a third class of individuals so constituted or so rendered by environment that because of some traumatism, whether it be mechanical or associated with disease, a favorable condition is developed at a particular spot for the sojourn of the bacilli, which, otherwise, would be annihilated by the tissues or excreted intact.

In this last class belong numerous instances where the local disease is diagnosed and appropriately treated, either by rest and constitutional invigoration, or by radical surgical methods, and the individual remains afterward as free from all evidence of tuberculosis as he was long before.

These cases in former nomenclature, and according to some writers of the present time, are the subjects of scrofulous or strumous disease, as instanced by such author's reference to *scrofulous* states of the joints, glands, skin, or kidneys. To express a constitutional tendency, these adjectives may be correct, but to use them to describe the disease appears ill-advised, in view of the known pathological factor common to all tuberculous processes. When this renal affection is viewed from the stand-point of surgical prognosis

it becomes of the utmost importance to ascertain whether the disease is a local or general one; terms which are approximately synonymous with operable and inoperable tuberculosis.

The subdivisions of the morphology of tuberculosis into miliary tubercles, cheesy necrosis, cirrhotic, cretaceous, and cystic formations, are but different, possible, and more or less commonly associated manifestations of the disease, whether it occurs as a general or as a local process.

We use the term "local" as best describing a tuberculosis when we are cognizant only of an active process in a single organ or an isolated locality, even when we may, from the patient's history, suspect a pre-existing focus elsewhere, but any evidence of which, by symptoms and physical signs, we are now unable to confirm. In a certain proportion of such cases this local lesion will be a *primary* lesion, both in the sense of time, as well as of importance, but in so many cases the lesion is a primary one only in the latter sense, that the less compromising and equally descriptive term local or focal is to be preferred.

In approaching the consideration of the regional disease, with which this paper has to do, Renal Tuberculosis, we first meet the question, "How does the Contagium gain access to the kidney? What are the channels of infection?"

We know of but three possibilities:

First, and vastly the most common, access of the bacilli to the kidney by the blood.

Second, access of the bacilli by their multiplication and the gradual development of tuberculous granulations along the ureter, or its lymphatic vessels, from the bladder—seminal vesicles or ovaries—"ascending urinary infection."

Third, access to the renal parenchyma through the capsule by an extension of the disease from a neighboring or some remote organ of another system.

In the first class, blood infection, we meet with a wide range of possibilities during both intra and extra-uterine life. The evidence, accumulating from a variety of sources, permits no longer much doubt regarding the transmissibility of tuberculosis from mother to fœtus by way of the blood. So that this form of hereditary disease means, as was first insisted upon by Baumgarten, that the infecting germ itself, and not a dyscrasia merely, is transmitted. The only

question still to be determined, in this connection, is how the germ passes the vascular septum, and whether this delicate membrane, intervening between maternal and fœtal circulation, must suffer some impairment of its continuity before the bacilli can pass, the same question which, in the case of the kidneys, has received within the past few years much attention from several investigators. The clinical observation of years, as well as some recent experimentation, has pretty clearly shown that still more common than this direct maternal transmission of the bacilli is the inheritance of a dyscrasia, which renders the individual members of certain families more susceptible to infection after birth than is the average being.

It is to be recognized that nearly, if not all, of the human and bovine cases which have demonstrated the direct heredity of the bacilli, show an advanced tuberculous state on the maternal side, and a very early general miliary tuberculosis on the part of the offspring. The questions both of local and latent tuberculosis of hereditary origin are yet in abeyance, and must long remain so, for it will always be a difficult problem to solve, where the opportunities for infection, at any time subsequent to birth, are, as often happens, so ubiquitous, and where at the same time so great a range of possibility in the virulency of the contagium and the powers of resistance of the individual exists as to render the resulting disease one of great acuteness or marked chronicity.

In the post-natal state the respiratory and alimentary viscera which communicate directly with the outer world are obviously those which are most exposed to infection, but of the adult abdominal organs having no direct exposure, none, except the lymph-nodes, are more commonly attacked by tuberculosis than the kidneys. And this, possibly, because of their special function of excretion, or because of a less powerful antagonism than that of the liver and spleen.

Tubercle bacilli, then, to reach the kidney by the *vascular channels*, in the post-natal period, must ordinarily be taken up from the mucous or cutaneous surfaces by the lymphatics advanced to the veins, then to the arteries, and by one or other of the renals brought to the kidney and presented to a glomerulus for elimination. How often this is successfully performed, and when it is, whether an injury to the secreting membrane of the glomerulus must first occur or does finally take place, we do not know, but that

the kidney during the cyclical presentation of the bacilli is in great danger of infection we cannot doubt.

Weichselbaum's original demonstration of tubercle bacilli in the blood of a corpse, and Meisel's demonstration of them in the blood of a living tuberculous subject, and Durand-Fardel's demonstration of tubercle bacilli within and just outside the vessels of a glomerulus, where they had not yet excited the initial tuberculous process, or given the slightest microscopic suspicion of their presence by tissue change or otherwise, are all separate links in the chain of evidence tracing the bacilli from the blood until they are presented at the renal filter. And Sherrington's experiment, No. 18, is the only instance I find to demonstrate the passage of tubercle bacilli without evident lesion of the secreting membrane.

The necessarily more or less protracted presence of the bacilli at the terminal point in the renal arterioles, *viz.*, the glomeruli before they are either returned to the veins or excreted, render this portion of the kidney—the cortical—most prone to tuberculous lesions, whither the contagium is borne by the blood. Autopsies in cases of general tuberculosis show the cortical surface often liberally studded with tubercles. (Fig. 1.)

When one or more tuberculous foci have started in the cortical layer, their tendency, whether as pure or mixed infections, leads generally to a final eruption into one of the calyces and the renal pelvis.

As to the etiology of this vascular form of renal tuberculosis, the necessity of the presence of the tubercle bacillus is recognized, but, in addition, a certain proportion of the cases present in their histories some distinct reference to a fall or blow involving the side or back. These stories make it reasonable to infer that a temporary congestion or otherwise insignificant trauma has been the determining factor in establishing the disease, just as it is so often seen to be in a joint after injury, or in the lung after a pneumonia or an attack of measles.

The ascending urinary infection by continuity is a well-recognized process, but not so common. The mucous membrane of the ureters apparently offers conditions very favorable to the life and dissemination of the bacilli. An existing vesical tuberculosis seems to have a natural tendency to reach out toward one or other ureteral openings, and from there to gain the pelvis of the kidney, the caly-

ces, apices of the pyramids, medullary and cortical layer in the order mentioned.

It should be noted, however, that before this typical ascent is complete, a distinct focus in the cortical portion may be independently planted by the blood-channels.

Nor should we lose sight of the possibility of a tuberculous focus developing originally in the renal pelvis as a process secondary to the trauma there inflicted by lithiasis or a retained calculus. In such a case we might encounter a combined ascending and descending tuberculosis of one kidney.

The *muscular* coats of the bladder and ureters manifest a striking resistance to the invasion and the destructive processes of tuberculosis.

Two interesting cases of this were shown by Meunier and Chaput. In one instance an ascending tuberculosis had caused denudation of the mucous coat of the ureter near its vesical insertion, giving rise to an invaginated prolapse of the bare muscle presenting in the bladder as an attached cone.

In the other instance, a descending tuberculosis had produced a mucous invagination of both ureters into the bladder. Chaput describes the appearance as that of a large, soft, bud-like, hollow cone, its cavity being continuous with the ureter.

As to the immunity of the *muscular* coats of the bladder, Fig. 9 shows this clearly where tubercles cover the vesical surface, denuded everywhere of mucous membrane, except this intensely congested triangular patch within the sphincter, and this is slightly dissected up at its border.

The third mode of renal infection, viz., that by extension to the parenchyma through the capsule from a tuberculosis of another organ. The occurrence of this, natural as it might appear at first thought, is, however, not well substantiated. The renal capsule seems to exert the same protecting influence against such invasion as does the dura for the brain in tuberculous disease of the surrounding bone. The nearest approach, however, to a successful encroachment upon the kidney by a peripheral tuberculosis, pertains when access is obtained by breaking into the pelvis or lymphatic infection of a ureter, and from there continuing as an ascending process.

Whereas, in sarcoma or adenoma, the superior portion of the

kidney is frequently first attacked, and this, in a certain number of cases, is secondary to sarcoma of the adrenal, or elements of this gland which were displaced in the embryonic state, so that in this form of disease extension of the malignant element through the capsule appears to be not uncommon.

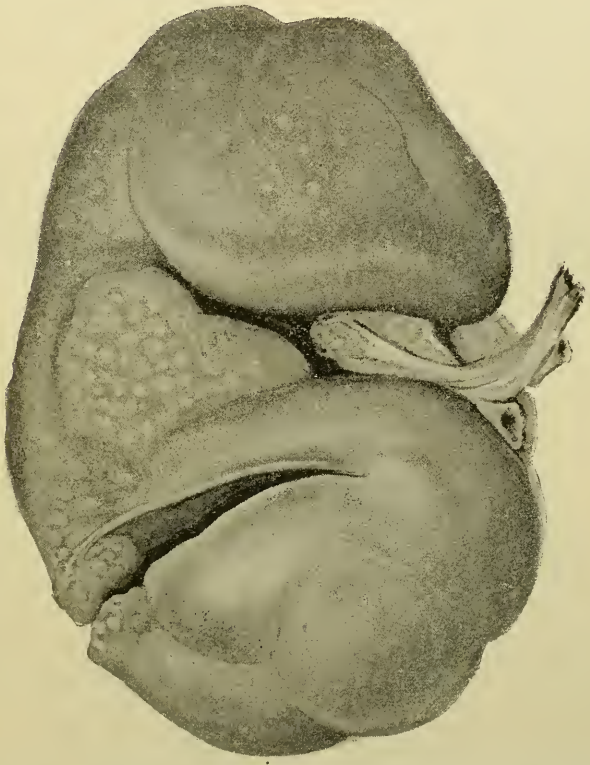

FIG. 1.—Tubercles Implanted by the Blood and Affecting the Cortical Region only of the Kidney (Brown).

The not very rare advanced tuberculous disease of the adrenals found at autopsy, with no evidence of the disease in its adjoining kidney, will accentuate this exemption of the organ from infection by a proximal but extra capsular lesion, and lead us at the same time to keep in mind the possibilities of a perinephritic tuberculosis, having its origin in the adrenal, not the kidney; and for this reason, to be cautious about any radical measures directed toward the latter organ when such an abscess is opened.

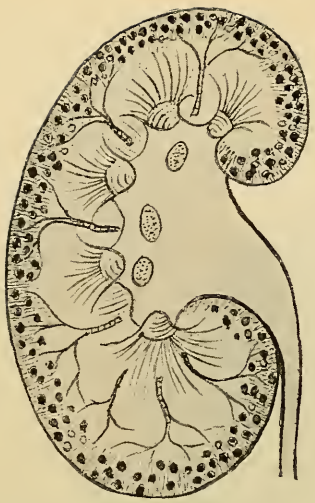

FIG. 2.—Tuberculous Infection of the Cortex by the Vascular Channels originally, then a Possible Lymphatic Diffusion in the Organ. (Du Pasquier.)

FIG. 3.—A More Advanced Stage of Cortical Infection. (Du Pasquier.)

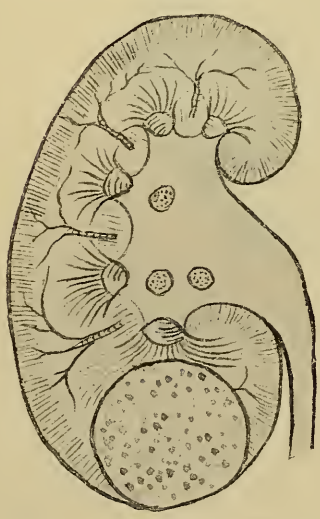

FIG. 4.—A Solitary Large Tuberculous Focus, originating in the Cortex by Blood Implantation, and Extending toward the Renal Pelvis. (Du Pasquier.)

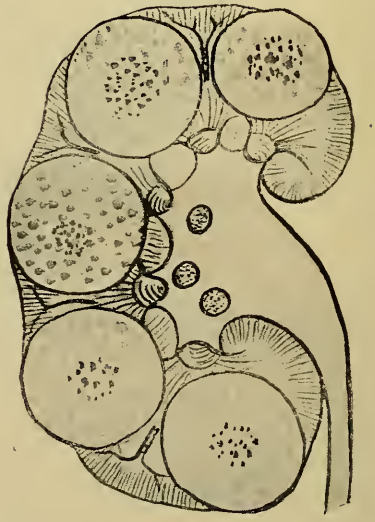

FIG. 5.—Multiple Tuberculous Foci, originating in the Cortex and Extending toward the Pelvis. (Du Pasquier.)

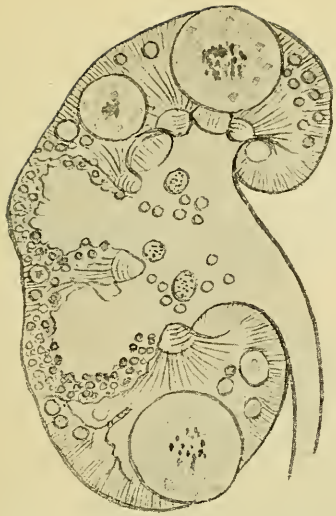

FIG. 6.—Multiple Tuberculous Foci of the Cortex, two of which have broken into the Pelvis. (Du Pasquier.)

FIG. 7.—Multiple Foci of the Cortex, many of which have broken into the Pelvis. (Du Pasquier.)

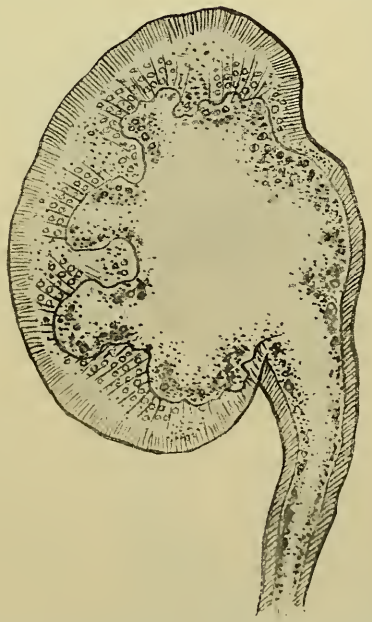

FIG. 8.—Ascending Renal Tuberculosis. No primary invasion of the cortex, but a gradual extension in that direction from the thickened and distended ureter, pelvis, and medullary portion. (Du Pasquier.)

In the majority of cases it is an easy matter, on examining a tuberculous kidney when removed, to determine the mode of infection.

One which has derived its contagium from the blood will, in the early stage, show small tubercles most generally in or near the cortex, well illustrated in Fig. 1, and also in Fig. 2, of these schematic drawings taken from Du Pasquier. The advancing steps in processes of the same mode of infection are depicted in Figs. 2, 3, 4, and 5. Finally, a stage is reached when the renal parenchyma yields to the destructive distention, and an eruption into one or more of the calyces takes place. (Figs. 6 and 7.) Now the conditions exist for a descending tuberculosis by continuity, or lodgement of the bacilli in the urether, bladder, or uretra, but unless ureteral occlusion happens by a detached necrotic mass, or the bacilli encounter favorable environment, such as a chronic posterior urethritis, the pelvis, ureter, and lower urinary tract may long escape infection, perhaps show none whatever at autopsy, as in the beautiful example in Fig. 9. Despite this fact the subjective symptoms in such a case may for a considerable time be referable to the bladder only.

Thus far the recognition at autopsy of a renal tuberculosis of vascular origin is simple. But when, in its descending progress, the pelvis, ureter, and bladder become implicated, it becomes necessary in order to distinguish such an ensemble from one of ascending variety to contrast the pathological appearances and estimate the relative ages of the lesions presenting at these two distant points in the urinary tract (that is, the cortical portion of the kidney with the base of the bladder). If we find the former relatively exempt, although the pyramids and calyces have disappeared, and the walls of the pelvis are greatly distended, hard and thickened, the same condition existing, more or less, in the ureter, and the vesical disease far advanced, particularly if the prostate or seminal vesicles show signs of antedating the bladder lesions, we may then conclude that the kidney has been attacked by an ascending tuberculosis (Fig. 8) and right kidney (Fig. 9), both of which show this ureteral and pelvic dilatation and thickening, as well as a massive excavation of the medullary part of the kidney, while the cortex is comparatively intact. Sometimes we will find, on autopsy, one kidney which has been destroyed by a cortical infection (Fig. 9 left kidney) but its ureter free from disease, while the bladder is extensively tuber-

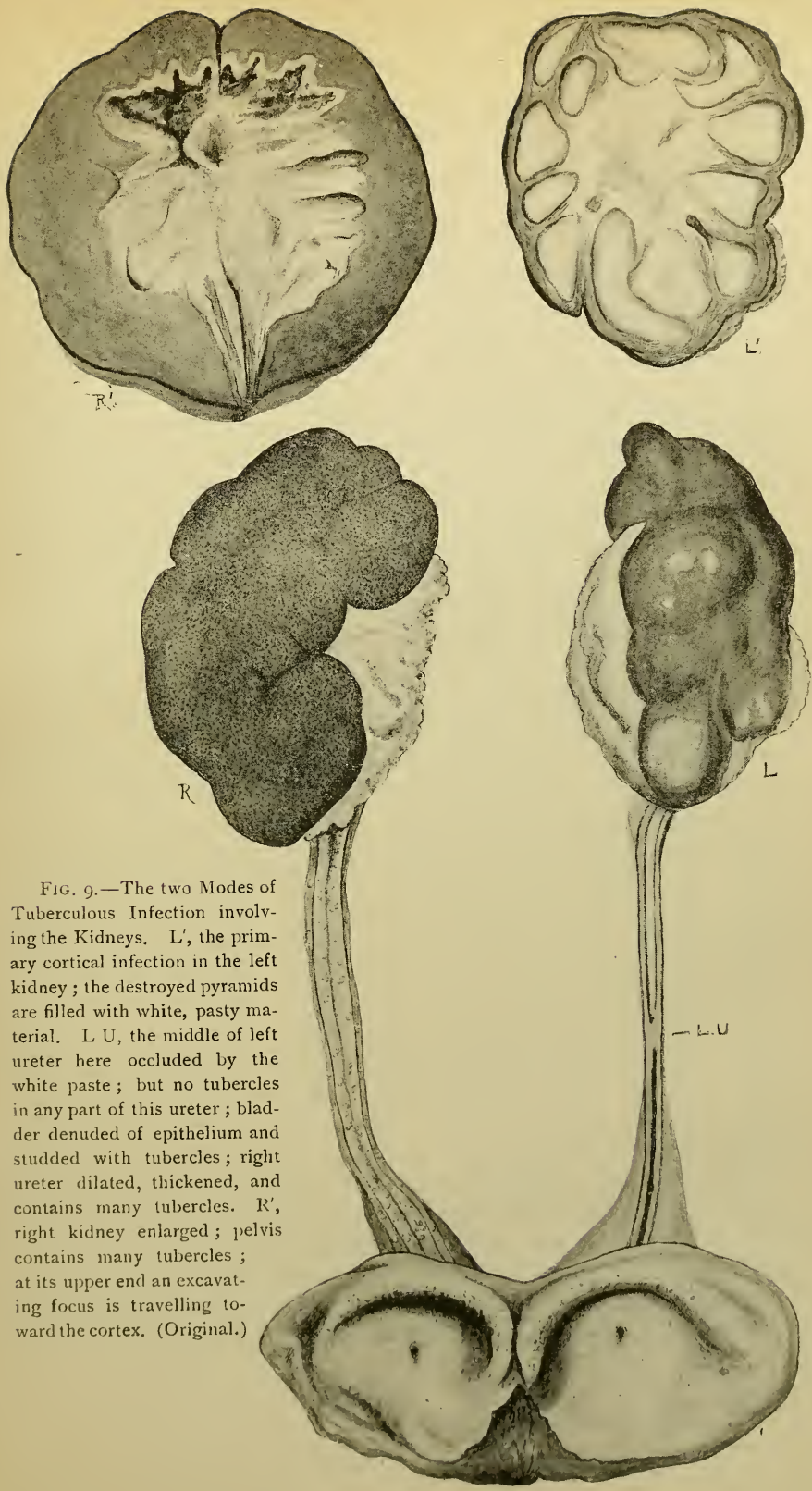

FIG. 9.—The two Modes of Tuberculous Infection involving the Kidneys. L', the primary cortical infection in the left kidney; the destroyed pyramids are filled with white, pasty material. L U, the middle of left ureter here occluded by the white paste; but no tubercles in any part of this ureter; bladder denuded of epithelium and studded with tubercles; right ureter dilated, thickened, and contains many tubercles. R', right kidney enlarged; pelvis contains many tubercles; at its upper end an excavating focus is travelling toward the cortex. (Original.)

culous, and the other ureter and kidney show advanced ascending disease. (Fig. 9.)

The pathology of renal tuberculosis is the same as that of the disease elsewhere, and its descriptive anatomy is mainly dependent upon the mode of invasion, the activity of the disease, whether or not the ureter becomes occluded, and the virulency of the contagium, or the powers of resistance of the tissues of the individual.

Durand-Fardel has shown the bacilli present within and outside of the vessels of a glomulus, where no cellular accumulation had yet taken place. We can believe that the bacilli when here found had been present too short a time to effect those changes which are recognized as the early ones of the tuberculous pathology. Since the publication of those valuable contributions of Prudden and Hodenpyle, in experimental pathology, we believe that these early stages are not necessarily due to any vital attributes on the part of the living bacilli, but that the positive chemotaxis of the proteids of these dead micro-organisms is an equally effective agent, if not the sole cause of the cellular approach and concentration.

However, in tuberculous disease, the appearance of these epithelioid and giant cells, the latter often containing one or more tubercle bacilli, and the entire cluster surrounded and interspersed with lymphoid corpuscles or leucocytes, is a typical picture of a commencing miliary granulation. This, at first, microscopic lesion, progresses to a stage where it becomes a grayish-white or yellowish tubercle, large enough to be seen by gross inspection, and to be felt. (Figs. 1 and 2.) The further development of this single lesion or the coalition of several similar lesions leads, by coagulative necrosis, to the cheesy nodule. When this is sufficiently augmented at the expense of the surrounding tissue, it breaks, either into one of the calyces, or, much more rarely, lifts the renal capsule and forms a soft tumor between it and the cortex, or, perhaps more rarely still, breaks through the capsule and institutes a perinephritic tuberculosis.

Instead of a spherical necrotic advance the disease may assume a linear intertubular fibro-cellular extension, and when thus generally disseminated give rise to a genuine tuberculous cirrhosis of the kidney, as described by Enriquez and Hallion, Hanot and Gilbert, and Coffin. Recently Vidal and Bezançon, in an experimental tuberculosis, believed that the sclerosis they had produced in the

kidney was dependent upon an insufficient virulency of the bacilli in respect to the tissues of the individual.

At times, by the access of pyogenic organisms to the pure tuberculous foci, large abscesses result, but we do not know, however, what conditions are necessary to transform the contents of a shut-up tuberculous lesion into hard, putty-like masses, which, at times, resemble those of some dermoid cysts. Tuffier thinks the obliteration of the ureter is essential to this change. Again, it is not very infrequent to find deposits of carbonate and phosphate of lime in the cellular or connective-tissue degenerations of tubercle, particularly in very chronic states, or in those lesions which are considered to be healed. When small concretions are passed in the urine by persons with suspicious symptoms, an examination of the powdered dust of a minute calculus will at times reveal the bacilli when a most thorough search of the urine has proven negative. This was the case in one of my patients. The calcareous concretions passed at one time are seen in the vial, and the drawing shows the tubercle bacilli in the detritus of one of them.

The not uncommon deposition in the bladder of considerable masses of cement-like material, due in part to the hyperæmic state of the vesical mucous membrane, and in part to the precipitating influence (?) upon the urine salts of the albuminoid necrotic matter descending from a tuberculous kidney, at times calls for cystotomy. Here the vesical symptoms and the detection of a stone may mask the long antedating renal disease. Such an interesting case was seen in a boy of fourteen who, when admitted to the Presbyterian Hospital, four months ago, was extremely emaciated; he had a high temperature and pulse, and his outlook appeared most hopeless. The history showed that for two years he had had frequent and distressing urination. During the past eight months he had been treated by different attendants for bladder affections. The experienced surgeon who sent him to the hospital on seeing him for the first time, detected a vesical calculus, and by epicystotomy removed a cretaceous, soft mass the size of a hen's egg. The state of the urine, the vesical and general systemic condition was not as greatly improved as it had been hoped; then a tumor in the region of the right kidney became apparent and increased rapidly. This was regarded rather as a pyonephrosis originating from an ascending vesical infection. I adjudged the kidney to be tuberculous, and the

starting-point of the long-existing bladder irritation. The tumor was now enormous, and demanded immediate attention, whatever its nature, and despite the inability to exclude the existence of other tuberculous foci, I advised and performed extraperitoneal nephrectomy. An unmeasured quantity of thick, creamy matter had to be evacuated by tearing the cortex at numerous places before the still

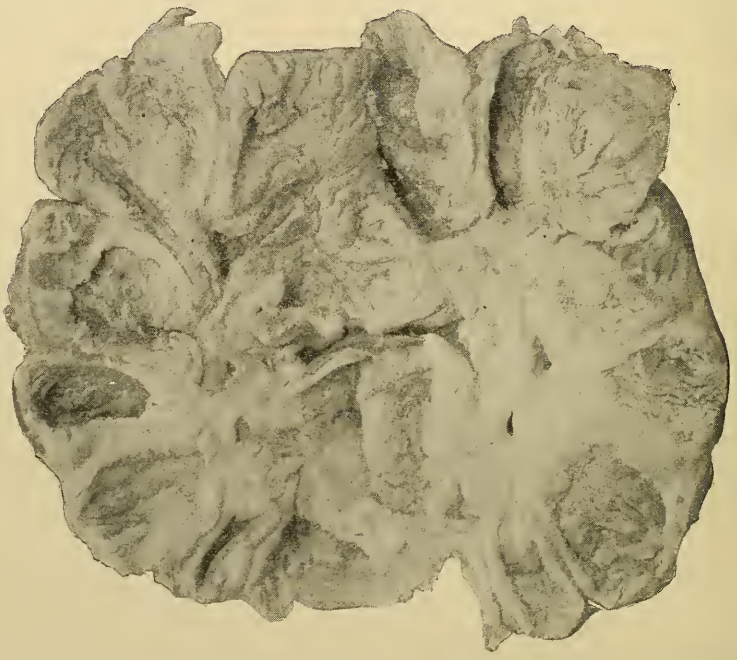

FIG. 10.—Cortical and Medullary Infection Resulting in a Very Large Tuberculous Kidney. Each of its twelve pyramidal portions being transformed into a discrete sac of matter requiring multiple lacerations to evacuate before the organ could be delivered. (Original.)

large but collapsed organ could be removed. Then the ureter and seminal vesicles, examined through the wound, were discovered enlarged and hard—undoubtedly tuberculous, as was the kidney (Fig. 10) found to be by Dr. Thatcher. Notwithstanding the presence of these remaining foci of the disease and possibly others of greater moment, he gained weight and vigor with striking rapidity, leaving the hospital at the end of five weeks with the wound closed. Since his worldly condition precludes any prospect of climatic ad-

vantages, I think his respite from another crisis of the same nature cannot be long expected. Of added interest in this case was a three-inch urethral occlusion, involving the meatus. Apparently caused by erosion of its mucous membrane by the passage of urine loaded with crystalline matter, or the existence of tuberculous lesions, or both, as well as the irritation incidental to the passage of a catheter during weeks for vesical irrigation before the epicystotomy had suddenly left the denuded urethra in a state of collapsed repose where opposing granulations effected the closure.

The membranous urethra was opened through the perineum. A small steel sound was safely forced forward out of the meatus. The new wound was retained for temporary drainage, to favor healing of the suprapubic one, and to spare the just-opened anterior urethra the irritating contact of urine.

Cystic degeneration of tuberculous origin and independent of ureteral occlusion is believed by some authors to occur. Klippel fully reports such a case. Both kidneys were similarly affected, but in different degrees. The contents of the cysts were more or less turbid and flocculent with cheesy débris, and some cysts had ruptured into the calyces. Neither of the pelves or ureters were dilated, thickened, or inflamed. Such cystic lesions are evidently started by the contagium coming to the kidneys by the blood. Tuberculous hydronephrosis is most commonly initiated by ureteral occlusion, due to ascending disease. Tuberculous pyonephrosis can just as readily be due to occlusion by cheesy débris or calculous precipitation derived from the already diseased kidney; in other words, by the descending process. In the former cases Tuffier has shown not only the impermeability of the ureter, but that the clear, yellow, retained fluid is free from all micro-organisms except tubercle bacilli, and they are only rarely found microscopically; but experimental injection of the fluid always proves its true nature.

The appearances of a kidney attacked by an ascending tuberculosis are emphasized by a dilatation and thickening of the walls of the ureter and pelvis. (Fig. 8 and right side of organs in Fig. 9.) The walls are tough, irregular, ulcerated, studded with soft tubercles and broken-down tuberculous tissue. (See right kidney in Fig. 9.) The calyces partake more or less of these manifestations before the apices of the pyramids become dotted with tubercles. It is at these papillæ that the renal parenchyma encounters the ascending infection

which now spreads upward, involving particularly the connective tissue and uriniferous tubules; the vessels, although more resisting, undergo obliterating destruction; a persistent microscopic amount of blood is lost, and at infrequent intervals a real hemorrhage may take place. Finally, large excavations in the gland result, the communications of which with the pelvis are open and wide; quite different from the narrow-necked channels connecting the cavity of a lesion of vascular origin with the pelvis. (See the contrast in right and left kidneys, Fig. 9; also the same contrast in Figs. 7 and 8.)

Some of the rarer manifestations of tuberculosis in the kidney are:

Renal epithelial tuberculosis. (Johnson.)

Renal ecchymotic tuberculosis. (Rayer.)

A specialized form of tuberculous nephritis, due to the compression of the uriniferous tubercules by the sclerosis, already referred to. (Coffin.)

Tuberculous renal cicatrization of Dieulafoy, Bard, and Le Dentu. The latter admits that such spontaneously cured kidney tuberculosis is very rare, but that it does occur.

Glomerulo-tuberculosis, where these bodies alone show invasion and the endothelial cells fill Bowman's capsule at the expense of the glomerulus, which is compressed and finally obliterated. (Cornil and Brault. Durand-Fardel.)

Tuberculous perinephritis is not strictly within our subject, and its consideration is purposely omitted.

The macroscopic recognition of a tuberculous kidney at operation, or even at necropsy, is not always easy. This is particularly true of those specimens where the lesions are small, and again where they are very large and manifest free suppuration, for, in the latter cases, if tubercle bacilli inaugurated the lesions, some subsequent pyogenic infection has occasionally augmented them, and perhaps obscured the characteristic initial features. The renal lesions most easily mistaken for those of tuberculosis are some where other microorganisms are the presumptive factors, as where only the bacillus coli communis is found. (Figs. 11 and 12.) The lesions in these two kidneys (Figs. 11 and 12) represent two periods in the early stages of what would probably have ultimately resulted in the so-called surgical kidney. Even in the early stages of septic infection the organs are slightly enlarged. Their surfaces show lesions which are

FIG. 11.—Recent Septic Lesions (Bacillus Coli Communis) in the Cortex of a Kidney removed during Life by C. McBurney. (Brown.)

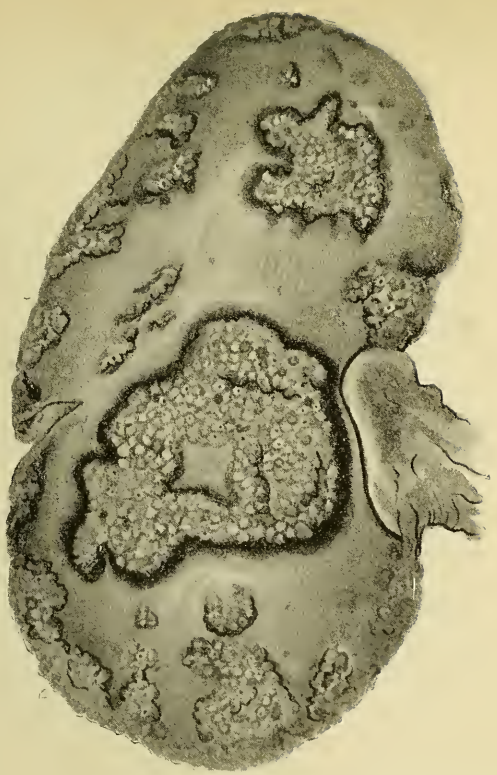

FIG. 12.—Septic Lesions (Bacillus Coli Communis) in the Cortex of a Kidney Removed during Life by A. J. McCosh. (Brown.)

resisting and raised, and occurring as isolated small papules or in irregularly circular plaques of confluent papules, which in places have become pustules, and then either open ulcers or depressed cicatrices where the minute abscess has been absorbed. The dusky color of the lesions and the surrounding inflammatory zone differentiate them clearly from the typical miliary tubercle or nodule seen in the same situation on the surface of the cortex in tuberculosis (Fig. 1).

The surgical kidney can present itself in two forms—most commonly as a greatly enlarged organ containing a varying number of suppurating foci with thin retaining walls of a dusky purplish color. The pus is often thin, owing to an admixture of the gland secretions. Less frequently is to be seen an organ which is contracted, hard, and densely cicatricial, so firmly adherent to the perirenal envelope as to be removed with considerable difficulty. By noting the acute superficial inflammatory process in Fig. 12 it is easy to understand that with the subsidence of this series of minute but confluent pustules, adhesions, cicatrices, and irregularities of surface would result. And if the same mode of healing attends similar foci scattered in the medulla, very considerable impairment of the organ must follow.

Again, some lesions of neoplasm (Figs. 13 and 14), of syphilis, of malaria, and of leprosy, can be mistaken for those of tuberculosis.

The impressions produced by minute disseminated carcinomatous foci, and those larger yellowish-white cancerous deposits, of a firm, cheesy consistency, are at times misleading. At a necropsy I saw recently these small cancer lesions in the lungs and kidneys, where they strikingly resembled those of gray, miliary tubercles, while the massive, putty-like, yellowish deposits in the liver were quite suggestive of the necrosis of the same disease.

A fine specimen of renal neoplasm in a very large kidney removed by Dr. Bangs, at St. Luke's Hospital, is shown in Fig. 13.

The exact classification of this as well as many similar renal tumors is in dispute. (Tuttle.)

In contradistinction to the yellow, cheesy necrosis of tuberculosis, Baumgarten likens the consistency of syphilitic gummata in the kidney to that of lard; besides these are, even when large, grayish white, and their slighter tendency to central softening in proportion to their size, is perhaps the reason which permits of a better artificial staining than is attainable with the necrotic centres of tuberculous nodules.

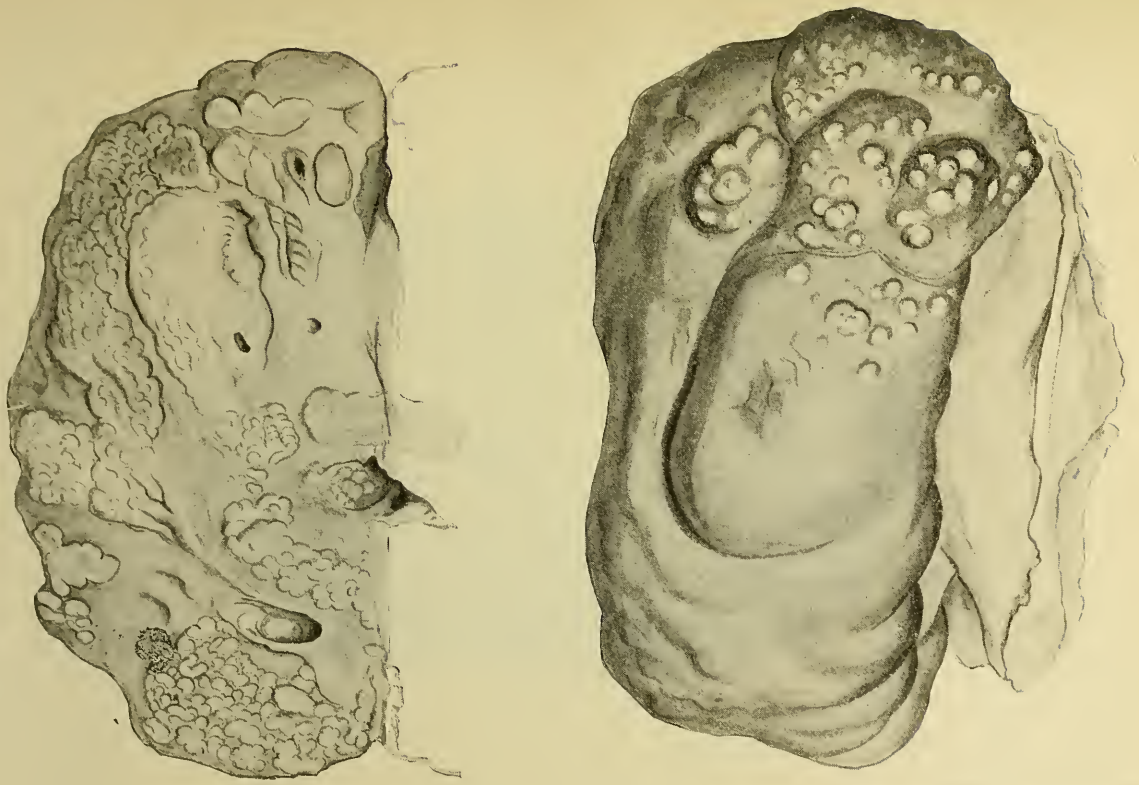

FIG. 13.—Questionable Neoplasm of Kidney. Nephrectomy by L. B. Bangs, by whose permission the original drawing was made for this paper. (Brown.)

Miliary tubercles are said to be closely simulated by the gross kidney lesions found in persons dying of acute malarial fever. Osler speaks of the occlusions of the renal arterioles by the parasite of malaria as not so very uncommon, and Saldatow, as well as Kiener and Kelsch, describe the pin-head size granulations made up of small embryonal cells and leucocytes infiltrated into the connective tissue

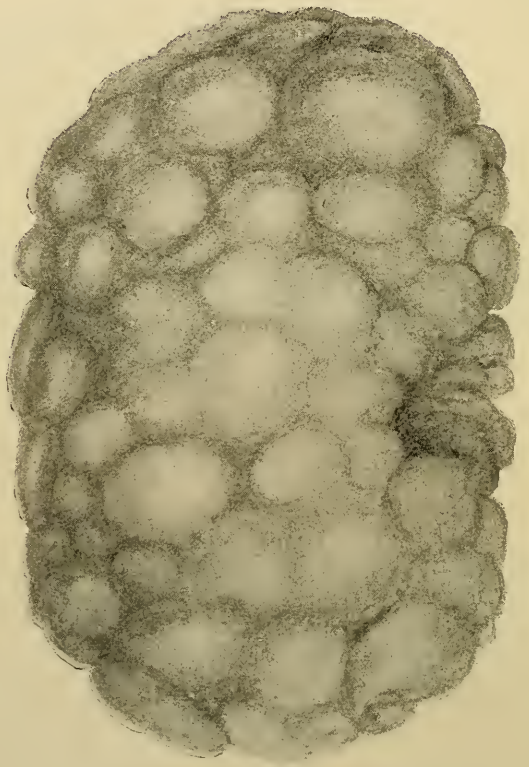

FIG. 14.—"Cancer" of the Kidney. (Rosenstein.)

about the occluded vessels. These lesions never tend to suppuration or cheesy necrosis. The not exceptional occurrence of severe hæmaturia in malarial subjects offers as well during life a chance to misinterpret for a tuberculous one this clinical manifestation common to both diseases.

That faulty observations in the dead-house were once more common than now, is instanced by many of the earlier statistics regard-

ing renal tuberculosis. The more carefully these examinations are conducted, the greater is the percentage of cases showing renal invasion—a remark apropos of the result which will attend more careful clinical study among the living and the use of the improved instrumental resources of to-day.

In the year 1849 to 1850, in 94 necropsies upon tuberculous subjects in Prague, Engel saw but 1 case of renal tuberculosis, and Willingk, from 1850 to 1852, in 476 tuberculous bodies saw but 7 cases. Chambers, however, in 1852—and he refers to his records as so strikingly at variance with those of previous statisticians as to almost excite incredulity—observed in 503 tuberculous cases 91 of renal involvement, eighteen per cent.

Recently Bondurant has published some interesting statistics of tuberculosis among the insane. They have no direct bearing upon our special subject, and will only be referred to in connection with the relatively greater susceptibility of the negro to the disease, the diminished power of resistance, and the greater death-rate in this race.

Thus, in the white race, one hundred and seventy-nine bodies showed twenty-eight per cent. affected with tuberculosis.

In the negro race, one hundred and sixteen bodies showed forty-two per cent. affected with tuberculosis.

Fourteen white bodies showed complete arrest of former tuberculosis.

Two negro bodies showed complete arrest of former tuberculosis.

Fifty white bodies showed miliary tuberculosis four times.

Forty-one negro bodies showed miliary tuberculosis fifteen times.

Very chronic forms of tuberculosis, so common among the white patients, was very rare among the negroes.

Morris's figures show during ten years at Middlesex Hospital, 2,610 total necropsies, and among these were encountered 44 cases of renal tuberculosis, somewhat less than two per cent. Of these 44 cases, 29 were of the miliary form, 15 of the "scrofulous," caseating form.

Of the 29 cases of miliary form, all showed tuberculosis in other organs than the kidneys, and in only one of these 29 cases was a single kidney involved. Of these 29 cases, 18 were in males, 11 in

females. As to age, the first decade contained the greatest percentage.

Of the 15 cases of "scrofulous" kidney, both organs were diseased in 8.

The detailed statistics show that of the 15, 14 revealed tuberculous lesions in other organs than the kidneys, but, as the author remarks, "It must be borne in mind that the conditions found at death do not prove that the scrofulous kidney did not exist for some time as the only disease in the body, and that it may even have been the primary lesion from which the others were derived." In two of the cases this appeared to be the fact.

Of these 15 cases of scrofulous kidney only one occurred at an age under 11. Nine males and 6 females were affected.

Dickinson's and Steinthal's statistics of renal tuberculosis, added to those of Morris, make a total of 134. And these show that in a little more than fifty per cent. both kidneys were diseased, though not to the same extent.

By the courtesy of Dr. Thatcher, I have had access to the morgue records of the Presbyterian Hospital, an institution whose medical and surgical service is essentially an acute one, while about four per cent. of the patients are children.

From the records covering three years and three months—February 1, 1893, to May 1, 1896—I have made the following compilation:

The total number of autopsies in this time was 567.

The total number of bodies showing tuberculous lesions anywhere, 68.

The total number of bodies showing tuberculous lesions of the kidneys, 23.

The total number of bodies showing tuberculous lesions of the spleen, 12.

The total number of bodies showing tuberculous lesions of the liver, 9.

Thirty-four per cent. of tuberculous bodies showed infection of one or both kidneys; four per cent. of the total necropsies showed renal tuberculous infection; 17.6 per cent. of tuberculous bodies showed infection of the spleen; 13.2 per cent. of tuberculous bodies showed infection of the liver.

Of the bodies showing renal infection, 13 were males, 10 were females.

The extremes of age represented were two and one-half months and seventy-four years.

Under five years the spleen and liver were more commonly the seat of tuberculous lesions than the kidneys; in adults, the reverse appears from these few cases:

Age.	Kidney Infected.	Spleen Infected.	Liver Infected.
1 month to 1 year	1	1	1
1 year to 5, inclusive	4	6	4
5 years to 10, inclusive	1	0	0
10 years to 20, inclusive	0	0	0
20 years to 30, inclusive	6	3	1
30 years to 40, inclusive	4	0	1
40 years to 50, inclusive	4	1	1
50 years to 60, inclusive	2	1	1
60 years to 70, inclusive	0	0	0
70 years to 80, inclusive	1	0	0
	23*	12	9

In two bodies the spleen showed infection where the kidneys did not.

In one body the liver showed infection where the kidneys did not.

In fifteen bodies both kidneys showed infection.

In eight bodies one kidney showed infection.

In two bodies both adrenals were markedly tuberculous, while in each only one kidney was affected.

There was not one body which showed tuberculous lesions of the kidneys, spleen, or liver, where either one or both lungs did not reveal active or healed lesions.

Of the sixty-eight bodies showing tuberculous lesions, a considerable proportion had not died from the disease.

Clinical observations, however, place the subject of local tuberculous lesions in a much more favorable light than do those of necropsy records. Partly for the reason advanced by Morris, and partly, I believe, because active lesions found in the lungs at autopsy are at times so insignificant as to have made them unrecognizable

* Males, 13; females, 10.

by physical signs and symptoms, and, in this situation, promising to be very chronic, or they may here be lesions for a long time inactive, and in only a limited sense appear as contra-indications, even if known to exist, to some radical operation upon a localized tuberculosis elsewhere. Such inactive lesions as Jordan describes as those of clinical, but not anatomical recovery. During the past few years many writers besides surgeons have insisted upon the sole localization of tuberculosis in other organs than the lungs, and for that reason they have advocated operative interference. Thus, Osler, in seventeen necropsies following tuberculous peritonitis, saw five cases showing that the process was wholly confined to the peritoneum.

The susceptibility of the kidney to infection by pathogenic germs carried to it by the blood has been clearly demonstrated, whereas the potency of the lymphatic channels for rapid and distant germ dissemination is not so well established, yet in the distribution of bacteria by the continuity of their pathological processes for limited distances and by comparatively slower progress, the efficacy of the lymphatics is perfectly appreciated. That this is the mode of dissemination in an ascending renal tuberculosis, as well as the mode of extension of the disease to the other parts of any already infected organ or group of organs, I am inclined to believe.

Hewetson says that in the Johns Hopkins laboratory it is almost the rule in examining bodies with intestinal lesions to find bacteria lodged in the internal organs, and more particularly in the kidneys.

It was a good while ago ascertained that the secretions and tissues of the healthy body do not contain bacteria, and it is now equally well recognized that when bacteria have gained an entrance to the body they may appear in the secreta. Particularly is this true when the germs are such as are known to be capable of exciting lesions in the organs affording the secretion. Thus, in Wyssokowitsch's experiments in seventeen animals subjected to intravenous injection of different micro-organisms pathogenic to the kidneys, thirteen times were the germs found in the urine.

The non-pathogenic germs, on the other hand, after awhile disappear wholly from the circulation without having appeared in the secreta.

As long ago as 1882 Cohnheim maintained that by renal excretion the human organism possessed the means of ridding itself both

of dissolved and organized poisons; among the latter he included tubercle bacilli, and he held that they could be transferred from a pulmonary source by the blood to the urine, and so enter the bladder, there to establish a tuberculosis without injuring or infecting the kidney during their passage.

Kahlden claims to have observed kidneys through which the bacilli have filtered, and which organs did not present the slightest alteration caused by the transit of the bacilli. The impossibility, however, of a thorough examination of the entire secreting tissue of a kidney must be apparent.

The investigations of Cavazzani and Wyssokowitsch led them to conclude that this passage of micro-organisms through the renal membrane could not occur prior to some lesion of the renal epithelium, and that such a lesion was associated with the escape of blood.

From his own experiments Sherrington decides that because proteids are not always discoverable in the urine, it is not necessary to insist upon the conclusions of Wyssokowitsch and others, according to which noxious bacteria escape in the secreta only when the blood itself containing them escapes. And yet he admits that his deductions are equally opposed to the extreme views of Colnheim and others who assert that the transit of bacteria across the renal membrane occurs while it is still normal in condition.

"This membrane," Sherrington says, "is rather to be regarded as then exhibiting in a minor degree the pathological change, which, when increased, will render it pervious to the same extent that the capillary wall becomes pervious in an area of inflammation." This opinion he believes to receive support from the fact that the injected germs are not immediately found in the secreta, but only subsequently after the poisons produced by the infection have had time to act upon the membrane and render it pervious.

Sherrington adds: "Among the species observed to escape through the membrane, even in the absence of escape of blood, are some that are not motile; this suggests that in their transit across the secreting membrane the bacteria themselves are passively conveyed, that the transit is less an active migration than a passive transferrence."

It is then a pertinent question whether victims of more or less acute general tuberculosis can present tubercle bacilli in their urine,

and yet not have a renal tuberculosis. One of Sherrington's experiments, No. 17, already referred to, would lead us to believe that this is possible.

I saw, two years ago, a case where this hypothesis could not but be considered. Six months earlier I had resected the left tuberculous knee of a man, twenty-eight years old, who, since he was ten years of age, had given evidence at different times and in different regions of this specific disease. Three months after the resection Dr. McCosh removed his right tuberculous testicle. Although this man had never experienced any urinary symptoms, I examined his urine before the last operation, and found tubercle bacilli in each of four mountings. I then examined the patient more closely in reference to vesical or renal symptoms, but with negative result. By this I was led to infer that the bacilli must have come from the urethra, prostate, or seminal vesicles. To test this presumption, some two weeks later I drew the urine by a sterilized catheter, allowing an ounce for cleansing the eye, to run off uncaught. As before, the urine by gross inspection was quite clear, but by centrifugal sedimentation a trifling number of pus corpuscles were obtained, enough to make six very slim mountings. Tubercle bacilli were found in each ; in nearly every instance the bacilli were in the leucocytes.

The urine was sterile to culture on the ordinary media. It was acid, of 10.22 sp. gr. There was not a trace of albumin, and, of course, no blood was found microscopically. The patient did not have to urinate during the night, and he had no frequency during the day.

This catheter test does not, of necessity, warrant the positive conclusion that the bacilli came from the kidney, but had they come from a vesical lesion, I think some epithelial cells would have been found with the pus cells. Since leaving the hospital I have seen this patient several times, and always found him going about in what he called "good health," having gained about fifteen pounds since his operation. All attempts to get some subjective evidence of urinary trouble was futile.

I presume someone has made extensive examinations to test the existence of tubercle bacilli in the urines of inmates of hospitals and homes for consumptives, in order to elucidate this question regarding the presence of the bacilli, despite the absence of all urinary symptoms, but I have been unable to get track of any such report.

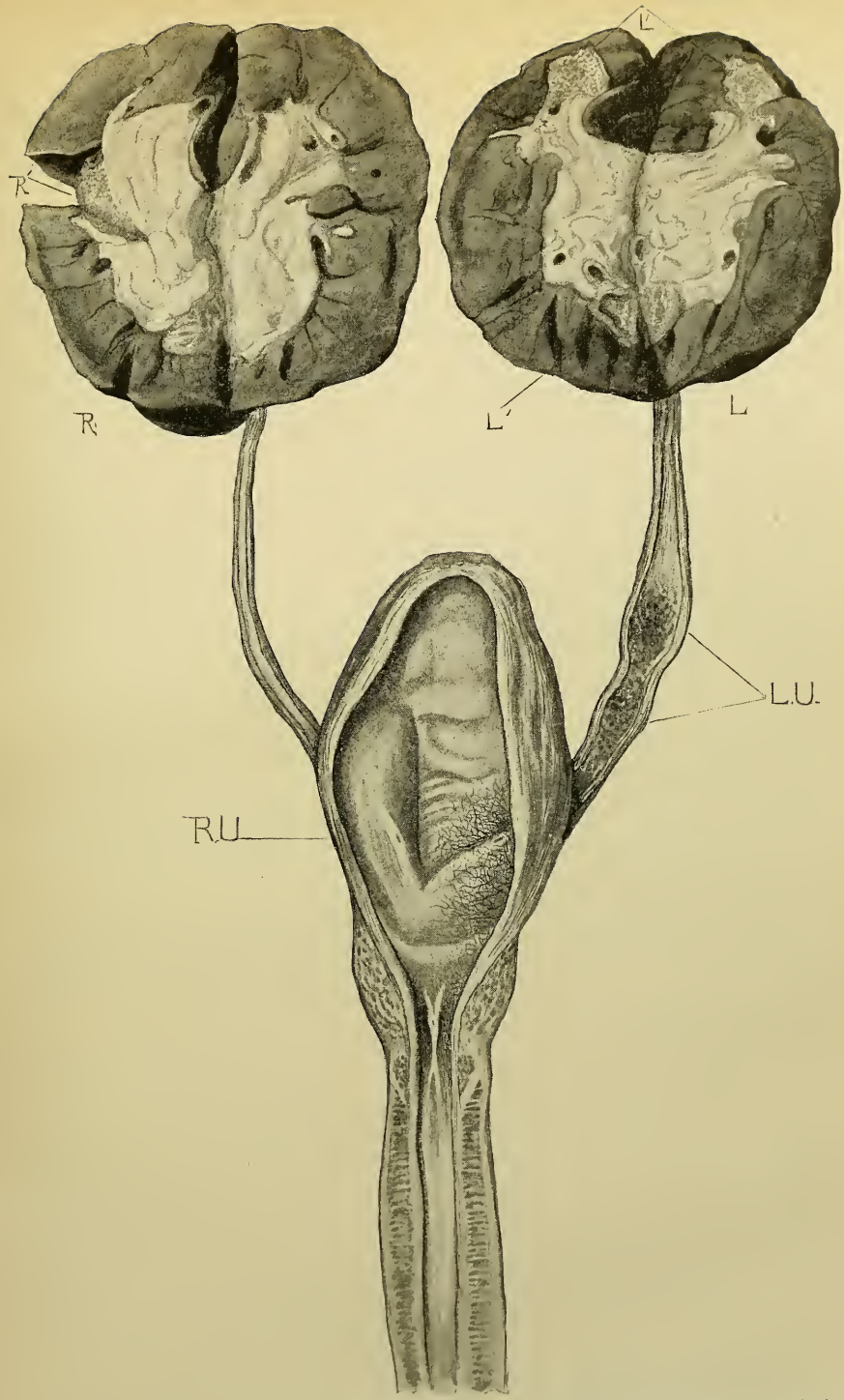

FIG. 15.—At L', two tuberculous foci in the medulla of the left kidney; each is in communication with the renal pelvis. At R', a single focus in the medulla of the right kidney; communication with the pelvis could not be demonstrated. L U, a double dilatation of left ureter containing a number of tubercles. About the left ureteral opening there are no tubercles, but a marked sympathetic hyperæmia pathognomonic of a descending tuberculosis R U, the right ureteral opening overlying a large tuberculous seminal vesicle. (Original.)

Since writing the above outlined history the subject of it has died in the Presbyterian Hospital of acute miliary tuberculosis of the lungs, after an illness of two weeks. He was taken rather suddenly ill, early in May, 1896, and sent to the medical side of the hospital, with a diagnosis of typhoid fever. It was again of interest to me to determine the source of the tubercle bacilli I had repeatedly found in his urine two years before. A necropsy afforded this opportunity. And I have the pleasure of showing you a picture of the entire urinary tract (Fig. 15), revealing in the left kidney two tuberculous foci communicating by the calyces with the pelvis. Also a similar lesion in the right kidney. The left ureter was dilated in two places, and contained a few minute tubercles. The vesical mucous membrane about the left ureteral opening was conspicuous by the size of its blood-vessels only. Both seminal vesicles had old cheesy deposits. The size and shape of that on the right side caused a marked asymmetry of the base of the bladder, shown in the drawing. (Fig. 15.)

Every portion of both lungs was studded with very minute tubercles. The patient's temperature had been almost constantly between 104° and 105° F. during the eight days he was in the hospital. The urine appeared normal and showed no albumin. It was not then examined for tubercle bacilli.

Whether this fatal attack of pulmonary tuberculosis was instituted by a fresh infection of more highly vitalized bacilli, or by autoinfection, by the very parasites he had so long nourished, must be left to inference.

The symptomatology and diagnosis of *Renal* tuberculosis, considered collectively, make up a rather complex picture. For we have to remember that the two channels of access for the disease—arterial and ureteral (*i.e.*, by lymphatics connecting with the lower organs of the genito-urinary group)—will, during the early stages at least, determine two dissimilar sets of symptoms. This invasion, by *the vascular route*, may be practically symptomless, or nearly so, until the disease has advanced to the formation of a palpable tumor, or has reached the stage of eruption into one of the calyces, which may occur (Fig. 15) at an early stage without preliminary tumefaction of the kidney. Then may be at once presented in a minor degree many of the symptoms which have pertained from the outset to the ascending variety, which latter form of the disease, by careful uri-

nary analysis, always permits of a comparatively easy diagnosis. And here I would insist upon the importance of the recognition of these two different modes of kidney implication in tuberculosis, for the elucidation of which we are mainly indebted to the French school. Unless we keep clearly in mind the possibility of a long-concealed renal tuberculosis of vascular derivation, as well as, on the other hand, the later renal invasion following in the train of more or less protracted, exhausting, and often agonizing vesical tuberculosis, we will be at a loss to explain the difference in the symptoms presented by successive cases of urinary tuberculosis, and not infrequently be surprised at a necropsy to find one kidney absolutely destroyed by a pent-up disease, when, during life, the patient gave no noteworthy evidence of such extensive renal trouble, if of any.

A summary of the different symptoms and evidences which have been advanced as in any way conducive to the diagnosis of renal tuberculosis, whether vascular or ascending in origin, will be fairly represented by the following :

The existence of a tumor corresponding more or less accurately to the position of, and evidencing by palpation, a kidney. Such a tumor may or may not be painful to palpation, or it may be the seat of spontaneous pain, often intermittent ; the tumor may be a centre from which pains radiate to different parts of the abdomen, to the lumbar spine, down the groin, or into the outer side of the thigh, or even into the opposite and healthy kidney. Again, without the presence of a tumor or an appreciable enlargement of the kidney, some of the symptoms just mentioned, and particularly some which follow, may be found to exist. Here given in the reverse order of their significance :

Pallor and emaciation. Œdema of the feet and legs. Reaction to the injection of tuberculin. Albuminuria. Moderate pyrexia. Night-sweats. Dysuria. Pyuria with acid urine. Hæmaturia with acid urine. Polyuria. Frequency of urination (thamuria). Turbid urine seen by the cystoscope issuing from a ureter. The finding of tubercle bacilli in that urine which is known to come from one or the other kidney, as when obtained by ureteral catheterization.

Most of these symptoms deserve more than mere mention regarding their relative importance.

Emaciation.—This is so eminently a common symptom of general constitutional as well as most acute infectious diseases that it

can by itself be of little importance, especially when we recall that very many patients with local tuberculous lesions are for some time, at any rate, surprising illustrations of rotundity and muscle.

To a somewhat less degree, the same remark may be made of pallor and cachexia. Although this symptom is common to a great variety of other diseases, I have not seen a case of renal tuberculosis where, even in the presence of good muscular development, the color was not open to criticism.

Œdema of the extremities deserves only the same importance attaching to other states of the organism characterized by a more or less early impairment in the quality and quantity of blood, and which impairment is apt, especially when aided by gravity, to result in œdema of the feet and legs. In the earlier stages of renal tuberculosis I doubt the existence of this symptom. Even in advanced stages of renal tuberculosis my experience has not led to its notice in more than two cases, and in each, after nephrectomy and improvement of the pre-existing extreme anæmia, it was scarcely noticeable.

Albuminuria, as a symptom, is much in dispute; but, in the great majority of cases, the reason for this difference of opinion appears to be easily explained. In that stage of either variety of the disease where the tuberculous lesions are in open communication with the urinary tract, serum, blood-corpuscles and leucocytes mingle with the urine in greater or less quantity in direct proportion to which the boiling and acid test reveals the presence of so-called albumin. Under these circumstances, and in this sense, albuminuria is a most constant symptom of renal tuberculosis.

But where the lesions are still enclosed in the glandular parenchyma—and this may be the case until the greater portion of the organ has been destroyed—the products of degeneration and vascular leakage are not mingled with the urine. The uriniferous tubules and glomeruli, which remain undestroyed, perform their normal functions, and albuminuria is extremely rare. If it does appear, casts and tubular epithelium also being found will probably mean a distinct form of nephritis incidental to the labor imposed upon the excreting channels by the more pernicious waste products of the entire system. According to Du Pasquier, Lacomb reports a case of death from double renal tuberculosis, and where during life albumin had not existed in the urine. When we can clearly differentiate be-

tween globulins and true albumins, not only will this symptom—albuminuria—be definitely settled, but we will have a valuable adjunct in assisting to differentiate a Bright's disease from a tuberculous nephritis.

The Reaction to Tuberculin.—Notwithstanding the implicit confidence reposed by veterinarians in this test for suspected bovine tuberculosis, it appears to be of such unstable value, when used for diagnostic purpose in the human race, as to deserve but slight consideration in helping to decide the nature of a renal disease. Could this agent be depended upon, it would be of inestimable value in the very cases (incipient cortical tuberculosis) where nothing at most but vague suspicions can be entertained until the stage of eruption into the pelvis.

Escherich's full report on tuberculin derived from clinical observation, undertaken for the purpose of determining its diagnostic value, must lead us to attach to it rather limited importance. But given a patient with a slightly enlarged or tender kidney, a slight evening rise of temperature, slight polyuria, and, perhaps, a just perceptible thamuria, and with these symptoms, reaction to tuberculin, one would reasonably suspect a pent-up renal tuberculosis.

Dysuria.—Unless there are associated tuberculous lesions of the lower urinary tract, excessive dysuria cannot be classed as a symptom of the disease in the kidney, and if the patient is closely questioned, it will be found that a certain discomfort or fatigue incidental to the frequency of urination exists, rather than real pain ; although the parts by reason of such constant activity are hyperæmic, and perhaps exquisitely sensitive to instrumental examination or the mildest topical treatment.

Tumor in the situation of a kidney is a notable symptom of the middle and later stages of both varieties of the disease. An enlargement of the organ, appreciable through the parietes, may occur before an extensive renal tuberculosis, starting in the cortex, has broken into the pelvis, as well as after such rupture where occlusion of the ureter leads to a hydro- or pyonephrosis. The ascending variety of the disease by ureteral occlusion may yield an intermittent hydronephrosis for a long time before the kidney becomes actually infected. Associated with the tumefaction will commonly be noted discomfort on palpation, attacks of spontaneous, local, and radiating pain.

But all of these symptoms occur in common with neoplasm, renal calculus, septic and movable kidney.

Pyrexia and Night-sweats.—Even in the early stages of incarcerated renal tuberculosis, a carefully made temperature record will not infrequently disclose a constant slight afternoon or evening rise, perhaps not so much as half a degree. This symptom, together with a slightly tender kidney, would tend to exclude calculus, but not to so great an extent neoplasm, whereas a septic kidney would be attended with greater extremes of temperature. In the later stage of extensive renal degeneration, whether accompanying an original cortical or ascending tuberculosis, where a state of systematic saturation with waste products prevails, the condition will commonly be accentuated by an afternoon temperature of 103° F. and by night-sweats.

Pulse.—During the early stages of the disease it cannot be possible to detect any change, but when well advanced, the rapid and relatively weak pulse is a more persistent indication of the impaired constitutional state than is the temperature. Particularly is this true of chronic cases.

Polyuria.—Almost the earliest establishment of a tuberculous focus in the kidney appears in some cases to cause an excessive glandular secretion, a symptom which, however, is not apt to be noted by the physician, and still less so by the patient. When other causes for it can be excluded—often a difficult matter in polyuria—we should view with suspicion this symptom as one of considerable value, especially because of its priority.

Pyuria and Hæmaturia.—These symptoms we cannot, of course, expect unless the renal lesion is an open one. Although tubercle bacilli are classified as essentially non-pyogenic, there will nevertheless be found in all open tuberculous renal processes a certain number of, perhaps very few, leucocytes enough resembling pus corpuscles to be called such. To the sterility of such pus-containing urine on ordinary media must be conceded a good deal of importance in welding the chain of evidence. I have seen, however, an excessive renal or ureteral pyuria, which, while it showed sterility, was proven by examination of the kidney after nephrectomy to be neither of tuberculous nor calculous origin, but to have been seemingly caused by peripheral partial obstruction of the ureter by a severe grade of seminal vesiculitis. Because of the strong signifi-

cance attaching to the sterility of an acid pyuria, it is well, before any vesical instrumentation is practised and contamination of the viscus thus endangered, to draw the urine through a sterilized catheter for culture tests. Of course, the fact of getting a growth of some pyogenic micro-organism does not exclude, although it minimizes, the probability of the disease in question being a tuberculosis. It seems fair to presume that a tuberculosis beginning in the kidney is more apt to be an unmixed infection than is an ascending one.

In this disease of the kidney associated with pyuria, is nearly always hæmaturia. The blood may merely be microscopic in quantity, or enough on sedimentation to reveal intermittently a faint pink line overlying the pus, or again, but rarely, a veritable hemorrhage. The varying grades of albuminuria, not infrequently found in tuberculous urine, are, as already said, most commonly accounted for by the blood and serum present.

The microscopic detection of the bacilli during an attack of severe hæmaturia is difficult, but upon its cessation more favorable conditions pertain, and at this time the search should be most thorough.

It is not out of place to recall here that hæmaturia occurring in children presenting the marasmatic condition commonly accompanying tuberculosis, is quite as apt to be a symptom of advanced scorbutus as of the former disease, just as in adults the hæmaturia is not so uncommonly associated with renal implication by the malarial organism.

We have finally come to that symptom—frequency of urination (thamuria)—than which none other is so apparent to the patient, or so instantaneously suggestive to the physician. This symptom alone, more commonly than any other, brings the patient to seek professional advice. If the history reveals that this thamuria is equally marked at night, the suspicion of tuberculosis is reasonably increased. In both varieties of the disease, and from the earliest until the final stages, thamuria is a prominent symptom. It must be noted, however, that there are periods during the continuance of the disease when this annoying frequency may have strikingly abated, but even now what there is of it will, in the majority of cases, be just as marked at night, a feature not common in any other disease.

As an interesting exception to what has just been said, I must instance again the case reported, and whose urinary organs are

represented in Fig. 14. This case of renal tuberculosis gave no subjective symptoms whatever.

When, with the cystoscope, turbid urine can be seen issuing from the ureter which belongs to a somewhat enlarged and tender kidney, and this urine is then drawn from the bladder by a sterilized catheter, or, better still, when with Casper's or Nitze's catheterizing cystoscope we bring this urine directly into a centrifugating tube, we are only one step removed from a positive diagnosis, attained when the bacilli are found in this urine by the microscope, or failing in this, if positive tuberculous lesions follow its injection into guinea-pigs, the cellular tissues on the inner side of the thigh of these animals being the preferable site for making the inoculation. The use of the ordinary bladder catheter for collecting urine for critical examination, particularly when an ounce or more is permitted to flow through it before making the collection, reduces to a minimum the chance of getting contamination from the glans penis, vulva, urethra, or seminal vesicles, but even the precaution mentioned does not wholly eliminate the possibility of error; even while the catheter is in place, reflux to the bladder from the vesicles may occur. If there are lesions of the bladder, both the facilities for successful employment of the cystoscope and the deductions to be drawn from ureteral catheterization are more or less impaired.

Besides the bacillus of leprosy, the only micro-organism I know which can lead us astray in microscopic diagnosis is the smegma bacillus. The morphology of this parasite, as well as its nearly similar reaction to the ordinary staining method for tubercle bacilli can, when present, easily be misleading unless generous alcoholic decolorization be employed, as was lately demonstrated by Dr. Tuttle, Assistant Pathologist of the Presbyterian Hospital, in the case of a patient under the care of Dr. McCosh. Mendelsohn and König, among others, recite surgical surprises which resulted from the mistaken identity of this bacillus.

The fact that the smegma bacillus is, at times, about as retentive of Ziehl's fuchsin stain as is the tubercle bacillus during the nitric-acid solution decolorization of the other elements of the mounting, makes it necessary to use strong alcohol as an additional differential decolorizer. Either follow the acid solution by alcohol, or use a mixture of the two, consisting of three per cent. solution of nitro-muriatic acid in ninety-five per cent. alcohol. The urine of a female

will naturally be more prone to contain smegma bacilli than that of a male, unless the latter has a prepuce, which, by its redundancy, forms part of the urinary channel.

Much space has been given to symptomatology, because I believe that for the well-to-do patient, especially, the physician who can make a positive diagnosis in the comparatively early stage of the disease renders more valuable service than does the surgeon who, in the same case, at a much later day, performs a successful operative nephrectomy.

In connection with that often misleading symptom, thamuria, I record the importance of looking beyond the bladder for its explanation, even if neither kidney is appreciably enlarged or tender, even if the cystoscope reveals one or several patches of hyperæmia and dilated vessels on the otherwise normal mucous membrane, still more then suspect disease in the kidney.

What these patches are I do not know, but I am satisfied that they are not infrequently associated with renal tuberculosis, and after nephrectomy has dispelled the urinary symptoms, these patches do not develop into tuberculous granulations.

Being aroused by these spots to a just suspicion of a renal tuberculosis, a successful catheterization of each ureter resulting in the acquisition from one side of normal urine and from the other of urine containing tubercle bacilli, we are in the best position in regard to what shall follow.

Any except palliative treatment for the renal implications of generalized acute miliary tuberculosis is, of necessity, excluded from consideration.

In a broad sense, all other grades of the disease ostensibly renal may be classified for preliminary treatment under two heads, a monetary basis being the dividing line. The rich will, as a rule, find their best resource in change of climate, careful attention to hygienic details, selected alimentation, and medicinal invigoration of the system. The poor, during the early stage of their malady, will receive greatest benefit from a treatment which approximates as nearly as attainable that just advocated for their more fortunate fellow-sufferers. And here I would say that, even when the poor man has to earn a still poorer livelihood in some invigorating climate, he is apt to gain by the change a degree of health which the best medical treatment of the city would fail to effect.

Theoretically, the earliest manifestation of a localized renal tuberculosis in either of these classes, would be best treated by an immediate and radical operation, but I believe practice has pretty clearly shown that the temporary impairment of vitality attendant upon nephrectomy is of more disastrous import than is the temporary presence of an early tuberculous lesion and the bacilli causing it, for a coexisting lesion elsewhere in the body, even if not active, may be pretty generally inferred to exist, and any depleting step at this time, when the system is not fortified, endangers the powers of resistance to a further and more rapid dissemination of the disease. On the other hand, if this small active tuberculous focus in the kidney is recognized comparatively early, and the individual is in a favorable state for operation, a successful nephrectomy at once will undoubtedly place such an one in the most fortunate position. But because a number of these very early cases can by other than surgical measures approximate a cure it is generally right to extend this opportunity if not encourage it before operating.

The measures referred to will be briefly outlined from my experience.

During the summer months camp-life in the Adirondacks or Canadian altitudes, living in a perfectly dry and well-ventilated log-cabin, sleeping in light, loose, flannel garments, is recommended. The avoidance of fatigue during the day and getting wet. The use of creosote in gradually increasing doses until seventy or eighty minims are taken daily.

During winter the continuance of out-door life in Asheville or some piney district on the same elevated range farther south.

Those who cannot leave the city can hope for at least temporary benefit by observing the general suggestions just referred to.

The following may be told in illustration of climatic influence:

In April, 1892, Dr. Trudeau kindly received at Saranac a patient in an advanced stage of right-side renal and extensive genito-urinary tuberculosis. This man had had the disease for about three years when I saw him. Surgical measures were out of the question, and even a change of climate seemed a hopeless effort. During the day he could retain his urine for but fifteen minutes at a time, and at night he wore a rubber bag because the urine escaped unconsciously and continuously while asleep. He had been in Saranac about two months when his daily intervals had increased to two hours, and he

threw away his night urinal. Besides this functional improvement, appetite and weight had increased, and tubercle bacilli were much less numerous in the urine. Before he left New York I could always find several minute cheesy particles which afforded a nearly pure culture of myriad bacilli. Although later, during his sojourn in Saranac, he had two crises, once when the other kidney, and again when the left lung or pleura became involved, he rallied from each in fairly good condition, and was feeling comparatively well when, after fifteen months, he insisted upon coming back to New York to work. Three days after arriving he lost his appetite; thamuria, hæmaturia, and night-sweats again appeared. Tuberculous lesions developed on the tongue, and he died within a month.

I will not detain you with the recital of several cases which have made surprising improvement, if not recovery, by following the course outlined above, but pass to the consideration of the surgical treatment of renal tuberculosis.

We all know that in the earliest stages of renal tuberculous invasion there are met at times exceptional examples, in some of which the environmental treatment, even if the patient can avail himself of its every detail, must be temporarily delayed until some urgent surgical indication has first received attention. In one case, the sudden appearance of a marked pyuria with fever, together with the discovery of an enlarged and tender kidney, in an individual who up to this time had not been conscious of ill-health. In another case, the sudden onset of severe renal hæmaturia, with moderate fever, the hemorrhage causing the formation of clots in the renal pelvis and ureter, and being passed with considerable pain in the kidney or radiating from it, and simulating that of renal colic due to gravel or calculus.

When such unusual symptoms mark the initial stage of the recognized disease, even if an appreciable active or healed focus exists elsewhere in the body, provided it be not in the other kidney, immediate nephrectomy is, in general, not only legitimate, but strongly indicated.

A good example of this was the sudden recognition of a well-advanced but pent-up renal tuberculosis, occurring in the service of Dr. Eliot. A woman, aged forty-three, was admitted to the Presbyterian Hospital with fracture of the right femur. A carefully taken history, physical examination, and urinary analysis gave no indica-

tion of past or existing urinary affection. Two weeks later, the patient being still in bed with the nearly normal temperature noted since admission, suddenly developed afternoon pyrexia of 103° F., pyuria with frequency, and tubercle bacilli were found in the urine. Palpation revealed a slight tenderness and enlargement of the right lumbar region. Nephrectomy yielded a large kidney with multiple cheesy cavities, only one, and the largest of which had recently broken into the pelvis and caused the symptoms described. The sudden pyrexia, in connection with the eruption of a shut-up tuberculous focus, is interesting, and, I think, a novel observation.

Another class of cases where prompt operation should be resorted to as soon as the disease has been located and diagnosed, is that in general where the individual has had every environmental and medicinal advantage—still the tuberculous focus in one kidney is advancing, and by the collective symptoms due to its activity, appetite, strength, and weight are failing, the size of the kidney, pyuria, pain, and febrile state are increasing.

The same resource is even more urgently in order for the hospital poor under approximately similar conditions.

The following illustrates such a case:

A woman, aged twenty-six, entered the Presbyterian Hospital complaining of thamuria. Examination showed also pyuria with acid urine, sterile on ordinary media; tubercle bacilli were found by the microscope, and guinea-pigs inoculated with the urine developed tuberculous visceral lesions. Cystoscopy revealed some small, but distinct, patches of hyperæmia; suprapubic pressure caused pain; palpation of the lumbar regions was negative. Vesical irrigation with weak potassium-permanganate solution, creosote medication, and improved hygiene effected some little benefit during the next year. At times there were considerable intermissions of the original discomfort, but a constantly increasing pallor, and a more haggard expression, was noted. All the subjective symptoms were still vesical and urethral. Lumbar palpation now elicited slight pain on the *left* radiated to the thigh. After a disappearance of eight months she called me, to find her bent over with a large and painful tumor in the *right* lumbar region, and a fluctuating mass over the appendix. Entering the hospital in a most deplorable condition, Dr. McCosh opened an abscess which pointed in front of the flank; it was post peritoneal, and had come forward from an eruptive lesion through

the cortex and capsule of an immense tuberculous right kidney. This he at once removed, after evacuating its necrotic contents, which distended the organ beyond the median line. Immediately after the nephrectomy the distressing vesical symptoms ceased. Within the past two weeks I have seen this patient. Now, nearly one year since the operation, she has gained many pounds, and is free from any ostensible symptoms of tuberculosis, and is able to take up housework again.

This case may serve to emphasize the frequency of only vesical symptoms when the kidney alone is tuberculous, and to illustrate the long immunity to the specific disease which the rest of the urinary tract enjoys to infection by the descending bacilli; in this respect, like the alimentary canal of phthisical children who so constantly swallow their tuberculous sputum with impunity.

The cases in which hopes of radical surgical treatment by nephrectomy would not be entertained are, in general, those where, in addition to an unquestionable focus in one kidney, the lower urinary tract is positively involved; where the other kidney is probably affected although the seat of a lesser grade of disease; where in the male the prostate, seminal vesicles, or testes are involved, and in the female the bladder, peritoneum, tubes or ovaries; but even in these cases, where the chief focus of offence is clearly located in one kidney, and its increasing size shows that the natural drainage by the ureter is wholly inadequate, nephrectomy, if only as a tentative measure, may be legitimate under conditions impossible to classify. A rapid and great temporary improvement at times follows.

In these same hopeless cases of multiple lesions, when natural ureteral drainage is wholly checked by occlusion of the duct, nephrotomy has in the past been advocated. Although at times the operator must be satisfied with this temporizing resource, I believe that if anything is done, a nephrectomy should be advised and prepared for. The idea of effecting the complete removal and closure of the sinus with greater ease and safety at some time subsequent to the nephrotomy is apt to be fallacious.

Again, these same apparently hopeless cases may be the subjects of exhausting renal hemorrhage, which sometimes can only be met by nephrectomy.

With regard to the operation of nephrectomy, I will only refer

to the primary incision, noting that it is of prime importance to give each case the benefit of thought as to the mode of approach best suited to its particular requirements.

Shall it be by an intra- or extraperitoneal route?

If the former, shall it be transmesenteric or transmesocolic? *i.e.*, intra- or extra-colic.

If the latter, shall it be lumbar or transverse?

It is so commonly necessary to enlarge in one direction or another the primary incision giving access to the kidney, that the resulting wound may be of almost any shape, and to attempt a distinct classification of these would be quite useless, if possible. On the other hand, it seems advantageous to have a name for the four well-recognized lines of primary access to the organ, whatever deviations the subsequent exigencies of the case may render expedient.

1st. The lumbar incision, approximately a vertical one at the outer border of the ilio-costalis muscle; extending from below the last rib to near the crest of the ilium—a wound more commonly made for nephrorrhaphy than any other operation on the kidney.

2d. The transverse (lateral) incision, starting at a point near the outer border of the ilio-costalis, and extending obliquely downward and forward toward the anterior superior spinous process of the ilium, and perhaps curving upward toward, to, or beyond, the umbilicus.

Associated with this incision is the usual practice of stripping the parietal peritoneum from the lumbar and transversalis fascia, with the intention of giving space, and, at the same time, not opening the peritoneal cavity. If torn, immediate suture will restore the protecting properties of the membrane.

This extraperitoneal incision is commonly used and, I think, advisedly, for the majority of conditions which require nephrectomy, particularly where the kidney is known to have purulent contents. In dry, clean cases the same incision, but terminating as a transperitoneal one, may be equally good.

3d. The transmesocolic incision starts ordinarily as a vertical one for two inches along the linea semilunaris, thence obliquely downward and outward one-half inch or more below the border of the ribs to the point of parietal reflection of the colic peritoneum, the mesocolon. The mesocolon is divided vertically and the kidney capsule exposed. This incision appears to me most advantageous in cases of

contracted, firmly adherent, and highly situated kidneys. When the ribs are lifted forward and upward, an excellent chance is given the hand to effect separations, and, subsequently, to reach the pelvis and ureter for palpation, or the parts of the pedicle for ligation.

The risk of peritoneal soiling must be admitted. If the kidney is large, thin-walled, and purulent, the soiling will be pretty certain to occur to some extent ; if these conditions do not pertain, the intraperitoneal compresses about the incision will be sufficient to protect the serous cavity.

The relatively small size and essentially one-sided position of this particular wound offers but an indifferent opportunity to examine the other kidney, a claim for the intraperitoneal incision, which, done even in a more favorable location, permits one to do little more than verify the impressions derived from extra-abdominal palpation, although what can be learned as to the state of the ureters, or the presence of stone in the pelvis, and thus indirectly of the kidneys, must be appreciated. In addition to the small adherent kidney requiring nephrectomy, this approach might be suitable to those cases of rupture and penetrating shot-wounds where ocular inspection and the least possible handling may be the determining factor in saving the kidney, or affording desirable space for its removal.

4th. The transmesenteric incision has its initial step involving more or less of the linea semilunaris, with a central point about opposite the middle linea transversa. When the omentum and ilium are drawn aside, the intra mesocolon is adjusted over that part of the kidney—usually the pedicle—which it is wished to reach most directly ; and the vessels crossing the line of incision here receive double ligatures. This operative approach is generally of most value in cases of large renal neoplasm, where quick and secure ligation of the renal vessels is of paramount importance to the position, size, or character of the wound through which the organ is delivered, a right-angled extension into the loin probably serving for this purpose. But in a number of cases of very large kidneys due to whatever cause, the colon will have been crowded toward the median line, consequently a mesocolic or transverse extraperitoneal incision will give easier access to the pedicle, as well as being the ready-made wound of exit for the organ.

To within a few years European statistics have shown the mortality in kidney operations to be surprisingly high. Thus in 1893

Facklam, reporting on the statistics of renal tuberculosis, gave the almost incredible general mortality in nephrotomy of sixty per cent., and one none too flattering for nephrectomy, of twenty-eight per cent.

A year later Vigneron, with a feeling that Facklam had too generously combined the general with the operative mortality in reporting on nephrotomies which he (Vigneron) rather favored, presented the entire matter, up to that date, with fuller details than the subject had before received.

He cites 54 cases of nephrotomy with a general mortality of 38.18 per cent.

He cites 54 cases of nephrotomy with an operative mortality of 12.72 per cent.

He cites the following statistics of different compilers regarding nephrectomy :

I.—*Abdominal Nephrectomies.*

Tuffier	11	cases, mortality,	26.3	per cent.
Facklam	13	" "	30.0	"
Vigneron	19	" "	26.84	"

II.—*Lumbar Nephrectomies.*

Tuffier	45	cases, mortality,	28.2	per cent.
Facklam	75	" "	28	"
Vigneron (primary)	65	" "	40	"
Vigneron (secondary)	20	" "	35	"

From a long observation of such cases in the private and hospital practice of New York surgeons, I have been satisfied that these continental figures of thirteen per cent. operative mortality in nephrotomy, and one of thirty per cent. in nephrectomy, would be disappointing results here. By the kind permission of Dr. McBurney, I have had access to the surgical histories of the Roosevelt Hospital, and thus am able to add its statistics of thirteen cases to those of the Presbyterian Hospital, numbering fifteen, since 1893, a total of twenty-eight nephrectomies. Two deaths occurred, a mortality of only 7.1 per cent. I have not limited the statistics to those done for tuberculosis, since that would greatly curtail the table, and, besides, I believe the operative mortality for this disease should be, and is, as low as any other condition requiring the operation. The reason

for this opinion is, in brief, that the more chronic the disease calling for nephrectomy, provided the other organ is fairly sound, the more favorable the operative prognosis, since the more or less functionless gland has long compelled its fellow to do the work for two. As a class requiring nephrectomy, the tuberculous is about as chronic as any.

	Cases.	Recoveries.	Deaths.	Mortality. Per cent.
Nephrectomies since 1893, Presbyterian Hospital .	15			
Nephrectomies since 1893, Roosevelt Hospital....	13			
Total nephrectomies	28	26	2	7.1
Male cases.....	12			
Female cases.....	16			
Oldest patient fifty-six years old.				
Youngest patient eleven years old.				
Extra-peritoneal nephrectomies	17	17	0	0.0
Transperitoneal nephrectomies.....	10	8	2	20.0
Tuberculosis *.....	9	8	1	11.0
Pyonephrosis.....	8	8	0	0.0
Hydronephrosis	2	2	0	0.0
Calculus and degeneration of kidney.....	2	2	0	0.0
Septic kidney (gross lesions on the cortex)	2	2	0	0.0
Rupture †.....	2	1	1	50.0
Abscess following rupture	1	1	0	0.0
Cystic kidney	1	1	0	0.0
Chronic diffuse nephritis	1	1	0	0.0

* One death, transperitoneal operation, sixth day; suppression. Necropsy: remaining kidney completely cystic.

† One death, transperitoneal operation, fourth day; high temperature.

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V.

ABSCESS OF LUNG—OPERATION—RECOVERY.

By W. P. Northrup, M.D., and A. J. McCosh, M.D.

MEDICAL HISTORY BY DR. NORTHRUP.

Florence A., born in England ; aged twenty-three ; a waitress ; entered my service with a diagnosis from her attending physician of fetid bronchitis.

Patient was well nourished, of a florid complexion, not anæmic. Her cough was somewhat troublesome, sputum muco-purulent (nummular), very copious, not offensive. After a few days in bed all symptoms seemed to moderate, her temperature regularly touching 100° F. daily, but mostly remaining at normal, the sputum diminishing in quantity, and general rational symptoms improving. The one thing which was most pronounced was the offensive odor (putrid, stink) of the breath.

Her father died of "abscess of the liver;" her mother still lives ; a sister died of "abscess on the kidney ;" a brother had Bright's disease. Her personal history includes several attacks of rheumatism between the ages of fourteen and nineteen. Otherwise she has had habitual good health.

During the winter, six months before entering the hospital, the patient suffered pretty severely from epidemic influenza. She had no physician, recovered in a few weeks ; so far as she knows, ultimately felt quite as well as usual. Her friends, however, think she has never been so well again, adding the further details—cough, easily fatigued, faintness, pain in the back, loss of color.

Two and a half months before entrance to hospital the patient had what the doctor denominated pleurisy. Her symptoms she describes as "chills, pain in right chest, headache, loss of flesh, night-sweats, fever." She was better and worse till September 13, 1895, when she entered hospital, and my personal observation began.

On the sixth day after entrance to hospital, after apparently doing fairly well, and possibly as the result of Carlsbad salts, the patient vomited, as well as had copious passages. On this day, however, further important symptoms developed. The temperature rose to 101° F.; on the following day to 103½° F., with pain in the chest and increased cough. On the third day the temperature reached 104° F.

Lungs.—Physical examination of the left negative, no exaggeration of respiratory sounds, no râles; right lung behind, râles over lower two-thirds, indifferent in quality, occasional, slight dulness over lower two-thirds, vesicular breathing heard close under the ear, no bronchial element to voice or breathing. Nothing heard over posterior or post-lateral aspects to give any clew to the diagnosis; certainly could not suggest a source from which such quantity of expectoration could come.

Anteriorly, at apex there was exaggerated pulmonary resonance and respiratory sounds. All positive physical signs were from the third pace down; over this area there was flatness continuous with the liver to the free border of the ribs.

The level of flatness gave the impression of a liver crowded up to the third space. The line of flatness was straight and sharp, from the sternum to anterior axillary line; here it became indistinct, apparently dipping deeply inward and turning downward to the liver flatness. It was as though a quart water-bag had been shoved in from under the sternum, crowding the lung upward, backward, and toward the axillary line. Over this area there was flatness continuous, absence of all respiratory sounds, no bronchial voice, and there were no râles or friction-sounds. It suggested the signs one gets where sarcoma has produced a solid tumor in the mediastinum or at the root of the lungs. The heart was not crowded out of its normal position.

The question which first presented was whether this was an encapsulated empyema emptying itself through the bronchial ways or abscess in the lung. It was at first thought to be probably the former, but when it came to exploratory puncture the opinions had rather turned to the second. Incidentally, the site and manner of puncture indicates the diagnosis entertained.

The patient was assisted to sit up in bed, the right forearm bent over the top of the head. A long, large-calibre exploring needle

upon a piston-syringe was used. The needle entered at a point just posterior to the breast, about the anterior axillary line and on a level with the third space (at sternum). It was then directed, not toward the superficial flat area, but deep, directed as near as possible toward the root of the lung, and thrust in up to its limit before drawing the piston. When the air was exhausted, the barrel promptly filled with thick, stinking pus.

This did not, of course, differentiate between an encapsulated empyema lying in the position of the illustrative water-bag, that is, touching the chest-wall in front, and extending deep, along the mediastinum and in the direction of the root.

The sputum was repeatedly examined for tubercle bacilli and actinomycosis rays without success. The nature of the process was never determined by exact tests.

The case was transferred to Dr. McCosh, with a diagnosis of deep-seated pus in the right lung, either encapsulated interlobar empyema or pulmonary abscess near the root.

SURGICAL HISTORY BY DR. McCOSH.

On admission of the patient to the surgical division, on September 26, 1895, her temperature was 104° F.; pulse, 125; respiration, 32; there was extreme dyspnœa, and the heart's action was very feeble.

Operation.—Ether. Several exploratory punctures were made with a large needle below and to the outer side of the right breast, but no pus was found. An incision two inches long was then made over the sixth rib below and just external to the right breast, in the anterior axillary line. A portion of the rib, one and a half inch in length, was excised, and an entrance thus gained into the pleural cavity, which was found free from fluid of any kind. This exposed the vault of the diaphragm, and superior to this, but not in contact with it, was felt the lung consolidated, contracted, and occupying the upper and inner half of the right thoracic cavity. The incision was carried upward and backward along the rib into the axilla, and an additional two inches of rib excised. The finger was then swept around the lung, which was seen and felt to be firmly adherent to the superior internal and anterior wall of the right chest. Except at the apex, however, there were no adhesions toward the external wall, and the contracted lung was at least two inches distant from

that part of the chest-wall where the incision had been made. A large exploring needle was plunged directly into the centre of the lung, and at the depth of two inches pus appeared in the syringe. The needle was left *in situ*, and along it an incision was made by scissors through the consolidated lung tissue until the abscess cavity was reached, when about three ounces of thick and very fetid pus escaped. The cavity was freely opened, and the finger passed into it broke up a number of trabeculæ, and pulled out a long strip of sloughing tissue which had a very foul odor. A soft spot being felt in the internal wall of the abscess, the scissors, guided by the finger, were plunged into this, and entered another cavity from which there was an escape of an ounce of pus of a similar character. This cavity was also freely opened, and all bands of tissue broken up by the finger. The hemorrhage from the incisions in the lung was insignificant, and needed no mechanical procedures for its arrest. The cavities were rubbed, and all loose and broken-down tissue swabbed away with gauze sponges. No irrigation was employed; strips of iodoform-gauze were packed into the cavities alongside of two soft rubber drainage-tubes. The ends of the strips and tubes were brought out through the opening in the chest-wall, and a copious sterile dressing applied. Severe shock followed, and for several weeks the patient remained in a very critical condition.

September 27. Temperature, 106° F.; pulse, 160; respiration, 38; dyspnœa and weak heart-action.

September 28. Temperature, 104° F.; pulse, 140; respiration, 50; profuse bloody expectoration with foul odor.

September 29. Temperature, 104° F.; pulse, 130; respiration, 50.

September 30. Temperature, 105° F.; pulse, 130; respiration, 48; distressing cough with offensive, purulent expectoration; dressing soaked with foul discharge; changed.

October 1–8. Temperature ranged between 102½° and 103½° F.; pulse, 125; respiration, 40; distressing cough continued, with bloody expectoration, the odor of which, however, was less foul. On the fifth day the tubes and gauze were removed, and after irrigation of the pleural cavity were replaced, this being repeated every second day.

October 9–25. Temperature ranged between 101° and 103° F., with evidence of morning remission; pulse, 120; respiration, 36;

profuse hemorrhage both from the mouth and through the wound occurred nearly every day, and the patient became very much exhausted by these and by the distressing cough which still continued. Turpentine inhalations seemed to control in a measure the hæmoptysis.

October 26 to November 1. Temperature, 101° to 103° F., with distinct morning remission; marked improvement; cough disappearing, as also the expectoration; pulse 110 to 120; stronger; appetite begins to return; discharge from wound less, and but little odor. During November all the symptoms continued to improve; gradual gain of strength; cough disappearing, as also the expectoration, which is free from blood and odor; temperature gradually became normal; discharge from wound gradually diminished. By the end of the month the cavity in the lung was apparently obliterated. The patient was out of bed for the first time on November 20, fifty-five days since operation.

During December the gain was very rapid. By the twentieth the cough had almost disappeared, as had the expectoration. The lung was slowly expanding. The opening into the chest was completely closed. Her general condition was so good that she was allowed to return to her home on Long Island, where she continued to gain flesh and strength.

June 1, 1896. Since leaving hospital the patient has lived at Great Neck, Long Island. Steady and rapid improvement; gain in weight twenty-five pounds; looks in excellent condition; no fever; no pain; occasional cough with expectoration of small quantity of clear mucus without taste or odor; on examination right side of chest measures half an inch more than left; no retraction or tenderness of cicatrix; lung evidently well expanded.

On deep inspiration, when almost at its maximum, a short, sharp, hacking cough was produced, as if perfect expansion of the lung was checked by a pleural adhesion.

SUBSEQUENT HISTORY BY DR. NORTHRUP.

July 6. Patient examined at my office and then taken to the hospital, where, in the presence of Drs. McCosh, James, Thornley, and the house-staff, the following points were established:

Right shoulder seemed slightly lower than the left; not known

whether or not it was naturally so. Possibly a little flattening under right clavicle ; cicatrix firm, healthy, and to front view could scarcely be seen, being concealed beneath the breast. General outlines of the chest, and general expansion, would not lead to a suspicion of any

FIG. 1.—Showing Cicatrix of Operation-wound along Lower Border of Breast, also General Good Nutrition of the Patient.

FIG. 2.—Showing Symmetry of two Sides ; Straight Spine ; Absence of Retractions ; Good Nutrition.

chest-lesion. Measurement of the halves of the thorax give one-half inch more length of tape to the right (operated) side than to the left.

No curvature of the spine ; liver not drawn up. The only thing that could be said positively of the chest was that "only the physical signs of an old pleurisy" were present. (James.)

At this visit photographs were taken to show, first, good state of general nutrition ; second, the little visible scar ; third, the symmetry of the thorax and absence of all signs of contracture.

The patient weighs one hundred and forty-five pounds, has been

for some months able to do the work of waitress; her friends say she is able to sweep and do most work, but is not so enduring as formerly.

SUBSEQUENT HISTORY BY DR. McCOSH.

The patient continued in good health until July 14, 1896, when she began to complain of pain in her right side. She consulted Dr. J. B. Welwood, to whom I am indebted for the following facts: The pain increased, and two days later she began to cough, the temperature being 103° F.; pulse 112; respiration 30. There was dulness on percussion over the middle lobe of right lung in axillary line, with bronchial breathing. Diagnosis, pneumonia. During the next ten days the fever and cough continued, expectoration increased and gradually became fetid. The temperature ranged between 102° and 104° F.; pulse 110 to 120; respiration 28 to 36. On July 29 the expectoration became suddenly very profuse, about ten ounces of almost pure pus being coughed up within a couple of hours. On August 3 I saw the patient with reference to an operation. There was an area of dulness and bronchial breathing beneath the old scar. Inasmuch as drainage into the bronchi seemed to be adequate, and as there was no evidence of exhaustion of the patient it was decided to delay operation. Within the next few days there was gradual improvement in all her symptoms. After August 12 the temperature gradually disappeared, the expectoration becoming less purulent and less fetid. On August 25 the fever had entirely disappeared, and the cough and expectoration had almost ceased. The patient reported to me on November 15; she was in excellent health, weighed one hundred and forty pounds, and had regained her full strength. No cough, no expectoration, no pain. The lung expanded to its fullest extent, and the "catch" which had formerly prevented a full inspiration, had entirely disappeared.

VI.

CASES OF GASTRO INTESTINAL SURGERY.

By Chas. K. Briddon, M.D.

The following five cases, three of obstruction, in which end-to-end anastomosis was made in two, and a lateral anastomosis in the other, and two cases in which gastroenterostomy was done for cancer, all through the medium of the Murphy button, are reported as of extreme interest in themselves, and as illustrating the value of that device in securing approximation.

Case I. Strangulated Umbilical Hernia. Fæcal Fistula. Intestinal Anastomosis and Murphy's Button Cure.

M. G., aged thirty-five ; married ; housewife ; admitted June 24, 1896.

The patient has been married seventeen years and has had eight children. After childbirth, eleven years ago, a hernia appeared at the umbilicus. Up to twenty-four hours before coming to the hospital it has never caused her trouble. Then while at stool a larger hernial protrusion took place, with severe pain. She began vomiting almost immediately, and continued to do so till the time of her admission to the hospital.

She then had a temperature of 98.4° F., and a pulse of 104. Examination showed a hernial protrusion the size of a large orange through the umbilicus. It was hard, tender, and tense. The skin over it was inflamed and black in spots.

She was immediately prepared for operation, and under ether a laparotomy was performed by the house-surgeon. An elliptical incision was carried around the base of the tumor down to the external oblique aponeurosis. The neck of the hernial sac was then freed and the sac opened. It contained some fluid, a large piece of gangrenous omentum, and about three inches of distended small gut. This last was of a bluish-black color, was not flabby, and its shiny

gloss was not lost. Hot pads were immediately applied to the gut, and changed at short intervals during the remainder of the operation, which consisted in pulling out the omentum till it was healthy, amputating the gangrenous portion (catgut ligatures being used), and in cutting away the inflamed sac and skin, the neck constriction having been previously enlarged. This occupied perhaps fifteen minutes. At the end of that time the strangulated gut seemed to be improved in circulation, and it was decided to anchor it in the abdominal cavity just beneath the incision. A catgut strand was therefore passed through the mesentery, and a piece of iodoform-gauze wrapped around the gut, the whole being returned inside the peritoneum. The ends of the abdominal incision were sutured with silkworm-gut, leaving the portion over the doubtful gut open. The patient made a good recovery from ether and had no reaction. All went well till the fourth day, when examination of wound showed fluid fæces coming from the returned gut. A stool from the rectum had meantime been obtained by means of licorice powder and an enema. During the next four days pieces of sloughed gut came away and all fæces were passed through the fistula. Their non-irritating character and consistency showed the opening to be low down in the small gut. The patient was put on a liberal diet, and panopeptone administered, and at the end of two weeks was seen to be holding her own in the matter of nourishment. Examination of the wound at that time showed a granulating wound three inches long and three inches deep, at the bottom of which could be felt the open ends of the intestine about one inch apart, the portion between these ends having sloughed away. In the left lateral aspect of the abdominal wound was a knuckle of intestine which has escaped through the peritoneal opening. It was covered by a layer of fresh granulations.

An intestinal anastomosis was determined upon. The patient was put on a fluid diet, restricting milk, for thirty-six hours, and the bowels thoroughly emptied with licorice powder.

July 8. Intestinal anastomosis. Murphy's button. Ether and a thorough antiseptic cleansing of the old operative wound, the cavity and open ends of gut, above described, being packed with iodoform-gauze. The skin around the cavity was then tightly sutured, thus shutting in all infection from the discharging intestine and the granulating surfaces. The field was again antiseptically cleansed. An

elliptical incision, five inches long in diameter, was made around the old closed cavity. This was carried directly into the peritoneal cavity on the right side, and revealed the stump of the omentum (from the first operation) adherent to the lower half of the base of the old wound, and the adherent intestine in upper half. The same thing was attempted on the left side, but the knuckle of intestine, above described as pointing into the first operation wound, made it very difficult.

By carrying the incision wide, however, on this side, this gut was avoided, and was then afterward bluntly dissected out of its granulative coat. The field of operation now presented a five-inch abdominal incision, in the centre of which was a mass of adherent intestine, omentum, and the closed granulating sac of the first operation. This whole mass was pulled, as far as possible, from the peritoneal cavity, and the latter protected with gauze-pads packed on all sides.

Then began the tedious process of separating the various components of the tangled mass. First, the omentum was worked loose, and its end cut off and re-ligated. In doing this the lesser peritoneum was opened. Then the coils of intestine were attacked, and with great difficulty the adhesions were torn, cut, or pushed aside, till all was free, and the two openings in the gut, with about three inches of intervening mesentery, were exposed. The granulating surface and the skin about the original operative sac was taken away *en masse*.

The next step in the operation was the actual intestinal anastomosis, which was by far the simplest part of the proceeding.

The open ends of the gut had become thickened and contracted, scarcely admitting the little finger. Accordingly, about half an inch of each end was sacrificed, the wound being protected from fæces by a gauze-strip tied round the gut about four inches from each end.

Next a wedge-shaped piece of mesentery was cut out, taking care to leave a good blood-supply to the cut ends of the gut.

A purse-string suture of fine black silk was now passed in and out through all the coats, around each intestinal opening, after the method advised by Murphy, so as to close the space in the mesenteric coats at its junction with the intestine. The male portion of the button was then fixed by the purse-string in one end of the gut, and the female in the other, and the button locked, a complete and well-

coapted anastomosis resulting. The mesentery was then sutured with fine catgut, completing the operation.

There were a number of eroded spots in the peritoneal coats of the intestine, on which powdered iodoform was dusted. A large pad of iodoform-gauze was then laid over the intestinal anastomosis and surrounding gut, and the whole returned inside the peritoneum.

The ends of the abdominal wound were sutured with silk-worm-gut (going through all layers), leaving an open wound for gauze tampon. Time of operation, one hour and fifty minutes.

Patient's condition not good, the shock being severe.

After History.—Free stimulation with strychnine and whiskey, and salt-solution enemata were used, but the patient failed to respond, and at the end of three hours a normal salt solution infusion of three and one-half pints, at a temperature of 115° F. was given Good response to this, and shock successfully overcome.

For three days rectal enemata of milk, panopeptone, egg and whiskey were used, nothing being given by mouth except small quantities of water.

Then fluid diet was started and gradually added to, till on the tenth day she was getting house diet.

The bowels moved on the second day after operation and every day thereafter, without catharsis, and on the eighteenth day the button was passed without difficulty.

The wound behaved well, the larger part of it uniting primarily, the central opening granulating rather slowly, necessitating confinement to bed for about six weeks. At the end of that time she had a good abdominal wall.

On her discharge from the hospital she was well nourished and strong, considering the long confinement she had suffered. She was eating well, and was free from any kind of intestinal disturbance, her bowels moving normally and freely.

Case II. Intestinal Obstruction. Enterectomy. End-to-end Anastomosis through the Medium of a Murphy Button.

B. J , aged thirty-three ; married.

Previous History.—One year ago she was operated upon for a large fibromyoma. An abdominal hysterectomy was performed with drainage through the vagina. She made a very rapid recovery and was discharged cured in January, 1895. Following her discharge she has been in perfect health until her present illness, which began two

days before admission to the Presbyterian Hospital, November 12, 1895. After a late dinner she was seized suddenly with severe abdominal pain situated in the epigastric region, followed shortly after by continuous vomiting. Twenty-four hours later the pain diminished, but the vomiting persisted. She had no movement of the bowels, and complained of deadly, sickening pain.

Physical Examination on Admission.—The patient well nourished. Her lungs and heart were perfectly normal. The abdomen on right side was resistant and exceedingly tender. A distinct mass could be felt between the umbilicus and the superior spine over the appendix region. Temperature, 100.6° F.; pulse, 96; respiration, 22. Urine entirely negative.

Patient's condition demanded immediate relief, and she was prepared at once for operation.

November 12, 1895. *Operation.*—Ether narcosis. Thorough antiseptic precautions. Careful palpation under anæsthesia confirmed the results of the previous examination. The same elongated tumor could be felt in the right iliac fossa. An incision four inches in length was made over this. On opening the peritoneal cavity a loop of distended intestine, which proved to be the lower portion of the ileum, presented. It was of deep purplish-black color, apparently gangrenous, the color shading off and becoming less intense as the gut was traced away from the point of constriction. A thorough examination of the parts was now made. The gangrenous intestine was found to start from a point low down in the pelvis, just to the left of the median line, and to extend to the right iliac fossa; from thence upward and around almost to its origin, occupying a position just in front of the ascending, transverse, and descending colon. Search was now made for the cause of the obstruction. This was found to be a small band extending from the wall of the pelvis on the left side to the stump remaining from the old hysterectomy. It was a thin band about one inch and a half in length. The obstruction presented the appearance of long standing, as the collapsed gut immediately below it showed evidence of inanition. This constricting band was drawn up on the finger and divided by scissors. The sudden distention of an area of intestine weakened by obstruction, caused one of the small gangrenous spots to rupture and the field of operation was flooded by the contents of the gut. This was quickly caught up on sponges and the peritoneal cavity protected

from further damage by pads. The discolored intestine was now drawn out of the incision, clamped above and below the area of deep discoloration, and resected with a wedge-shaped piece of the accompanying mesentery. An end-to-end anastomosis was now quickly accomplished by means of a small-sized Murphy button. After the two cut surfaces of the mesentery had been sutured with fine silk, the gut was replaced. Fearing possible infection the peritoneal cavity was flushed with large quantities of hot salt solution. The wound was left entirely open and provision made for free drainage by means of gauze-packing. The actual time of the operation was forty-five minutes.

The patient made a good recovery from the operation. She had no nausea or vomiting. For the three days following she received stimulation in the form of strychnine and whiskey. She was nourished by rectal enemata. During this time her temperature at no time was over 100.5° F. Pulse remained about 120, and of fair quality. Respiration, 24. Her general condition improved, and she received fluids by the mouth on the third day. There was a small constipated movement from the bowels on the fourth day as a result of an enema. After this her bowels moved daily, and she became more comfortable in every way until the sixth day after the operation. Temperature now rose to 102° F., and the patient did not seem as well. The wound was dressed. After the gauze-packing was removed a small fistula extending into the intestine was discovered. Its cause was not satisfactorily explained. Through this a continual discharge of fluid fæces was passed, and it became necessary to dress the wound frequently. At this time she seemed to gain—appetite was much better, and until the tenth day her progress was marked.

Symptoms of pneumonia now became manifest, and on making a physical examination there were some small areas of consolidation in the right lower lobe. The disease extended and proved fatal on the third day after its onset, on the twelfth day after the operation. There was no trace of the Murphy button by the rectum. In dressing the wound what seemed to be the button could be felt through the walls of the intestine until the day of the patient's death, when it could not be discovered.

PATHOLOGIST'S REPORT UPON REMOVAL OF INTESTINE.

Twenty inches of small intestine with mesentery; four inches slightly congested; sixteen inches very much congested; gangrenous in parts; mesentery intensely congested, hemorrhagic, and apparently necrotic.

Microscopical Examination.—Many hemorrhages in all coats of intestine and in mesentery, especially about vessels. Superficial portion of mucous membrane is necrotic.

Case III. Carcinoma of Colon. Intestinal Anastomosis with Murphy's Button. Recovery. Subsequent death from extension of cancer after formation of fecal fistula at site of operation.

W. L., aged thirty-seven; plasterer; Irish; admitted to Presbyterian Hospital, New York, on February 11, 1896.

The patient's entire history dated back only three weeks prior to admission to hospital. At that time he was attacked with rather sharp pain in the right iliac fossa, which continued more or less constantly until his admission, and extended up to the right hypochondriac region. Bowels had been constipated. He had lost flesh and strength. Vomiting had been absent.

On admission to the hospital, examination showed tenderness in the iliac fossa and above it, and the diagnosis of appendicitis made by his attending physician was judged to be probably correct. Temperature was 98° F.; pulse, 100. Urine normal. He was prepared for operation, and on the following day laparotomy was performed. Under ether a stony hard tumor of irregular outline was felt immovably fixed in the right hypochondriac and lumbar regions. It extended from the ribs to a level below the umbilicus and across to the median line. Diagnosis of malignant neoplasm was then made. With the patient in the dorsal position an incision five inches long was made along the outer border of the right rectus muscle, and the cavity of the peritoneum opened.

The omentum was found intimately adherent to the anterior and inferior surfaces of the lower border of the right lobe of the liver, to the upper portion of the ascending and right half of the transverse colon, and to the duodenum and adjacent small intestine. In the centre of this adherent mass was a hard nodular growth about two inches in diameter and one inch in thickness.

The surrounding adhesions were dense and their separation was tedious and attended with great difficulty. It was thought that the gall-bladder was the site of the growth above mentioned, but on exposing this viscus it was found free and healthy.

The centre of the mass was embedded in an excavation formed for it immediately in front of the hepatic flexure, and it was exceedingly difficult to enucleate from its position.

After ligating the surrounding omentum piecemeal, this enucleation was accomplished, and a section of the mass showed its malignant character. This was a secondary growth, the primary invasion occupying about three inches of the hepatic flexure of the colon, where it was intimately adherent to the abdominal wall. The posterior wall of the duodenum was exposed, and a coil of adjacent small intestine was closely adherent to the tumor.

Two hours had been already occupied in the operation, and as the successful performance of a colectomy seemed doubtful, a lateral anastomosis of the bowel above and below the growth was decided upon. This was quickly and easily done by means of a Murphy button. With the intestine opened, its interior at the situation of the tumor was explored with the finger, and no stricture could be felt, but the walls were very much thickened and irregularly indurated.

The abdominal wound was partially closed, a gauze-drain being introduced to the site of anastomosis, and an aseptic dressing applied.

The patient left the table in good condition; no unfavorable symptoms followed. Temperature never rose above 101° F. and the patient seemed sufficiently nourished. For the first three days diet consisted of panopeptone, with liberal quantities of vichy and water.

After that he had full fluid diet, *i.e.*, sixty to seventy ounces of milk and broths in twenty-four hours. All progressed favorably till the fifth day, when there was evidence of fecal discharge through the abdominal sinus left for drainage. This discharge increased and all the fæces were passed through this channel.

On the seventeenth day the button was passed through the anus.

About one week later he began to fail and on April 8, nearly two months after operation, died from exhaustion and malnutrition, his stomach refusing to retain food toward the end.

Unfortunately, an examination of the parts involved could only be made through the operation wound. That was sufficient to determine the cancerous nature of the disease, but insufficient to throw light on the point from which the fæces escaped. As the button passed through the anus on the seventeenth day, it is probable that the leak was not from that portion of the intestine in contact with the button, as under those circumstances, it would probably have escaped through the wound. The parts of the intestine that were approximated were apparently healthy, but it may be possible, as the disease was extensive, that perforation occurred at a point above.

Case IV. Gastroenterostomy. Von Hacker's Posterior Operation for Cancer of Pyloric Orifice.

J. R., aged fifty; Irish; laborer; admitted May 16, 1895.

Previous History.—Always well until six months ago, when he began to be troubled with his stomach; has been moderately alcoholic; denies syphilis; had gonorrhœa thirty years ago.

Present trouble began last February, when he noticed a swelling at the inner end of left clavicle; it was associated with some tenderness at that time, but no pain; the swelling and tenderness gradually increased, and at last became the seat of pain of a shooting character, extending over left side of neck and head; has lost strength and twelve pounds in weight, and during the last three months has been much troubled with vomiting.

On Admission.—Appetite poor, bowels constipated, vomits after eating.

Urine.—Normal. Temperature, 99° F.; respiration, 24; pulse, 86.

Physical Examination, May 17.—Emaciated. Tongue coated. Immediately over left sternoclavicular articulation is a fusiform swelling the size of a small egg. Skin over it is not discolored or adherent. It is difficult to determine whether it involves the articulation or only the sternal end of clavicle. Its most prominent part gives a sense of elasticity, or obscure fluctuation. No lymphatic engorgement. Liver is small. Lungs emphysematous. Arteries thickened and rigid. There is a small, hard, painful nodule in right hypochondrium. Stomach, when distended with carbonic-acid water, reached well below the umbilicus.

May 21. Complains of indigestion and has vomited several times; to-day he vomited about a quart of undigested food.

May 26. The obstruction appears to have been well demonstrated. He takes food well enough, and then, in twenty-four or forty-eight hours, will reject all that he has taken in that time.

Operation advised and refused; discharged at his own request.

Readmitted June 15. Since leaving the hospital he has become much emaciated. From examination of the vomitus, it is estimated that no appreciable amount of food passes from the stomach into the intestine.

Physical Examination.—Much thinner. Sternoclavicular growth as before, or, if anything, slightly increased in size. Epigastric tumor same as at last examination.

The stomach was treated by predigested food, lavage, and gastric disinfection.

Operation, June 19.—Ether, and the institution of a rigid asepsis. Transverse incision across the middle of the epigastrium, four inches in length, and on opening peritoneal cavity, the finger came immediately upon the stomach with a hard nodular growth occupying its pyloric extremity; cardiac end was dilated; there were a few nodes in the gastrohepatic omentum.

The omentum and colon were raised, the lesser peritoneal cavity was opened by blunt dissection through the transverse mesocolon, the stomach was rotated forward on its long axis to expose its posterior surface, the upper part of the jejunum was brought to the surface, and followed up to a point eight or ten inches from its junction with the duodenum, the loop was placed in contact with the exposed surface of the stomach, and after protecting the adjacent viscera with gauze-pads, incisions one inch long were made in the stomach and intestine, the usual purse-string suture was applied and secured around the internal cylinder of a Murphy button; the approximation of the cups left nothing to be desired. Time of operation, thirty minutes. Patient left the table in excellent condition.

June 20. Patient has been treated by nutrient enemata of egg, salt, panopeptones, and Sp. Frumenti; these were retained, and he was not annoyed by vomiting. On the twenty-second feeding by the mouth was begun. On the twenty-fifth feeding "per rectum" was stopped and he was put upon fluid diet.

June 29. Light, soft diet; bowels move regularly, without help.

July 2. Button passed "per anum," and, on August 11, the

patient, who had been on regular diet for some time, was discharged, having rapidly regained his health and strength.

The swelling over the sternoclavicular articulation was opened and curetted, and the material removed was ascertained to be tubercular.

This man regained sufficient strength to enable him to resume his occupation as a laborer, and presented himself occasionally at the accident ward for observation. Shortly after his discharge he was presented to the members of the Surgical Society, when nothing could be found in the epigastrium.

May 1, 1896. The house-surgeon reports that the tumor is much larger than before; that there are evidences of recurrence in the cæcum, and that his general health is beginning to again fail. At this present writing, sixteen months after the operation, he is failing fast.

Case V. Cancer of Stomach. Gastroenterostomy with Murphy's Button.

J. K., aged thirty-nine; Irish; laborer. Admitted to the Presbyterian Hospital on September 16, 1896, giving a typical history of gastric carcinoma with partial pyloric stenosis. His sickness dated back to March, when he began to suffer from gastric pain and distress after eating. Two months later vomiting soon after eating became a symptom, and from that time this and the pain were constantly present. The vomitus was the undigested food, and for two months prior to admission to the hospital, practically all the food taken had returned sooner or later. The pain was relieved by vomiting. He rapidly lost weight and strength. On admission to the hospital he was much emaciated, and cachectic in appearance. In the epigastrium could be felt a stony hard tumor about three by four inches in its diameters. Its exact position varied with the empty or distended condition of the stomach. In the former condition it occupied a position about midway from the ribs to the umbilicus, and to the left of the median line. When the stomach was distended with fluid, the tumor shifted to the right of the abdomen, going as far over as the mammary line, and the dilated portion of the stomach lay below it.

The patient was kept under observation for one week, and as practically all the food taken was vomited sooner or later, a gastroenterostomy was decided upon.

September 23. *Operation.*—Ether narcosis.

A transverse incision, three and a half inches long, was made across the centre of the epigastrium, and the peritoneum opened. The transverse colon, with the stomach lying above it, presented in the wound, but the omentum was apparently absent at this point, there being no anterior wall to the lesser peritoneal cavity. An extensive cancerous growth was seen occupying the whole of the lesser curvature of the stomach from the cardiac end to the pylorus, and about half of its anterior wall. The left end of the stomach was dilated into a large pouch. It had been proposed to anastomose the intestine to the posterior wall of the stomach with a Murphy button, this point being selected to facilitate the passage of the button into the intestine when it should slough away. To reach this part of the stomach an opening through the transverse mesocolon was made, the stomach drawn through it, and the anastomosis made behind the colon ; with this idea in view, the transverse colon was next drawn forward, and the mesocolon put on the stretch. But owing to the lack of omentum above mentioned, the very short mesocolon and the apparent implication of the posterior wall, the procedure was deemed inadvisable. Accordingly, the colon was dropped back, and a healthy point in the dilated pouch of stomach selected as the best place of anastomosis. The small intestine was then drawn into the wound, and coil after coil pulled out, till one end—presumably the jejunum from its point of attachment—was reached. Either half of a Murphy button was then fastened in the usual manner in the lateral wall of the intestine and of the stomach, and the button locked. A close anastomosis was thus obtained, the colon lying behind the point of connection.

The abdominal wound was sutured without drain.

September 24. A good recovery from ether was made, and the patient showed no shock.

September 25. Rectal feeding was used, nothing but sips of water being given by the mouth. In the afternoon the patient vomited a large quantity of fecal matter and material resembling the nutritive enemata. This could only be explained on the ground that the ileum, and not the jejunum, was used in the anastomosis.

September 26. Fluid nourishment in small quantities was tried but was not retained, the vomiting still being fecal.

October 12. A slow starvation took place, and the patient died

on the nineteenth day after the operation. During that time he had two dejections, but neither contained the button.

Post-Mortem Examination through Operative Wound.—The stomach was anastomosed to the ileum six inches from the cœcum. The proximal portion of the loop of intestine, at the apex of which the button had been fastened, was bound down closely to the distal portion, and was so contracted and adherent that it was with great difficulty that a passage through it into the stomach was found. The distal portion, on the other hand, was dilated, and the opening between it and the stomach was direct and large. This condition gave the appearance as though the intestine had been divided transversely, and one end anastomosed to the stomach, while the other was closed into a blind sac. The two portions of the loop were in exceedingly close apposition and union for a distance of three inches from the stomach.

The anastomosis itself was as perfect and strong a union as could be imagined. The button was lying loose in the dilated left end of the stomach.

Remarks.—Thoroughly conversant with the not infrequent accident of taking up the small intestine at a point too distant from its origin, the finger and thumb of the right hand were used to determine the part of the pancreas lying on the vertebral column, and a loop of gut was seized which apparently crossed from right to left just below the pancreas; pulling on this did not appear to determine that it was fixed, and loop after loop was passed through the fingers until we arrived at a point where it was fixed; unfortunately, this was at the wrong end, and at no time after the probable condition was recognized was the patient in a state to warrant reopening the abdomen.

VII.

A CASE OF PRIMARY (?) ACUTE MALIGNANT ENDOCARDITIS, ILLUSTRATING THE DIFFICULTIES IN DIAGNOSIS.

By Francis P. Kinnicutt, M.D.

J. C., male; aged twenty-seven; was admitted to the medical wards on March 3, 1896.

Previous History.—The patient has been married four years, and during this period, his wife states, he enjoyed excellent health until about six weeks ago. She knows of no previous illness; and a similar statement is made by the patient's brother. During the past six weeks he has suffered more or less from malaise and headache, the latter at times severe in character. On February 27 he complained of repeated chilly feelings, increased headache, and of great prostration, and was obliged to take to his bed, where he remained until admission to the hospital. In the interval there was apparently continuous fever, with delirium at night, and vomiting on two or three occasions. There were no severe lumbar pains; constipation rather than relaxed bowels was present. There is no evidence of exposure to any contagious disease, and there is no history of traumatism. On admission to the wards the patient was immediately seen by me and the following notes were taken:

The patient is of slight frame and is well nourished. He is not anæmic. A moderate degree of delirium is present. Temperature (mouth), 102° F.; pulse, 110 and full; respirations, 30.

Examination of the lungs reveals no more than scattered sibilant râles. The liver is apparently of normal size. Splenic dulness extends to the anterior axillary line, but is not increased upward. The edge of the spleen is not palpable. The abdomen is not distended, and there is a general absence of sensitiveness on pressure. The heart's apex-beat is palpable in its normal position. A soft systolic

murmur, not transmitted to the left, is appreciable over the mitral area, and a similar murmur is faintly heard at the base.

A profuse scarlet rash is noticeable on the anterior, and especially on the lateral surfaces of the trunk, and on the outer surfaces of the forearms. It consists of minute erythematous points, disappearing on pressure, and in all respects resembles the eruption of scarlet fever. There is an absence of any eruption about the face and neck. The pharynx and faucial pillars are of a dusky red hue. The tongue is moist, thickly coated in centre, and the papillæ are prominent and red. The urine has a specific gravity of 1.030 and contains ten per cent. albumin, estimated volumetrically, and a few granular casts. There is an absence of diazo-reaction.

The patient has an anxious facies and presents an extremely ill appearance. A positive diagnosis was impossible, and the patient was removed to the isolating ward for further observation.

The scarlatinal eruption was believed to be of the nature of the so-called initial rashes, not infrequently occurring in the developing stage of several of the acute specific exanthemata, noticeably in variola. Its presence on the beginning of the fourth day of the acute illness would have anticipated the characteristic eruption of variola, typhus, and typhoid fevers. The mode of onset of the illness had several of the features of any one of these diseases. The presence of delirium at so early a period of the illness, the great prostration of the patient, and his extremely ill appearance, were against the supposition of typhoid fever, and suggested either typhus fever or variola, notwithstanding the very moderate elevation of temperature.

During the two hours subsequent to admission the diagnosis was rendered more uncertain by a rise of temperature to 106° F., and the development of a profuse petechial eruption throughout the erythematous areas. With the fever, the delirium, paroxysmally, became very violent.

On March 4, the fifth day of illness, the temperature was 107° F., and was maintained at a lower level only by baths given every four hours. The scarlet rash became somewhat more general, but was confined to the trunk and extremities. The petechial eruption remained unchanged. A profuse eruption of small, rather pointed, papules of a dusky red color was noted on the shoulders. There were six stools—black, liquid, and offensive—during the day subse-

quent to the administration of a small dose of calomel followed by a saline. The abdomen was not distended or tympanitic. The diazo-reaction was absent. Examination of the viscera revealed only the signs noted on admission. Through the strict limitation of the cutaneous manifestations to the trunk and extremities, it was considered possible to eliminate the incidence of hemorrhagic variola, but not the existence either of the rare hemorrhagic form of typhoid fever or of typhus.

On March 5, the sixth day of illness, the morning and evening temperatures were respectively 107° and 106.5° F., in spite of frequently repeated baths. The scarlet rash had nearly disappeared; the petechiæ were very abundant, but discreet. On the back, a few rose-colored spots, disappearing on pressure, were noted. The tongue was dry and cracked, there was a distressed facies, the delirium was so violent as to necessitate the strapping of the patient to the bed. The diazo-reaction was absent and there were no further stools. The edge of the spleen was not palpable. The heart murmurs were barely appreciable. There was moderate leucocytosis, 1,900 per c.mm., militating against the existence of typhoid fever.

On March 6, the seventh day of illness, the morning temperature was again 107° F., the evening temperature 103° F. The petechial eruption began to fade, and there were no fresh points. Some of the papules on the back had developed into pustules. There were no fresh rose spots. The patient's general condition remained much the same, but there was marked rigidity of the cervical muscles.

On March 7, the eighth day of illness, the morning and evening temperatures were 106° F. A number of fresh rose spots appeared on the back, some being only modified by, others disappearing on pressure. The diazo-reaction was absent, the edge of the spleen was not palpable, the number of leucocytes suddenly fell to 3,000 per c.mm. The bowels remained constipated.

On March 8, the ninth day of illness, both morning and evening temperatures were 106.2° F.; the rose spots which had appeared on the previous day rapidly faded. During the day large areas of exudative erythema, very sensitive to pressure, developed on the dorsal surface of both hands, and a number of wheals appeared on the lower extremities.

Percussion of the muscles in all regions of the body produced

marked fibrillary contractions, and there was general muscular tremor. The rigidity of the neck muscles was marked. There was no paralysis of the ocular, facial, or trunk muscles. Typhus fever had been eliminated from the diagnosis, and it was considered probable that the patient was suffering either from cerebro-spinal meningitis, or malignant endocarditis.

On March 9, the tenth day of illness, the temperature remained at about 105° F., with more decided drops after the baths than previously. The erythematous patches everywhere assumed a hemorrhagic character (purpura urticans), and large fresh hemorrhagic areas appeared on the dorsal surface of both feet. A large number of fresh minute petechiæ scattered over the surface of the trunk were also noted.

In addition to the rigidity of the cervical muscles, there was marked stiffness of the upper extremities. The prostration was extreme, the delirium disappeared, and death occurred, without further symptoms, at the beginning of the eleventh day.

Marked discoloration of the entire body occurred within five minutes after death.

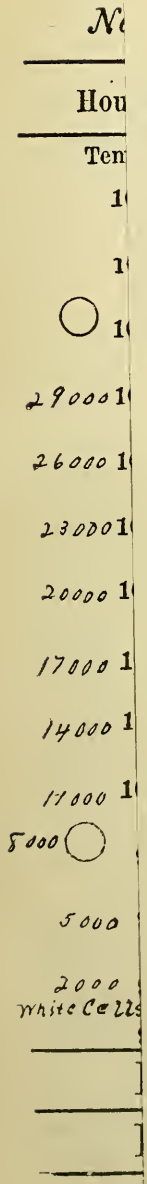
The temperature chart is appended, together with the report of the autopsy by Dr. Tuttle, the assistant pathologist of the hospital.

In view of the findings of the autopsy, the case is one of unusual interest in several respects.

Primary malignant endocarditis is of very rare occurrence. Its existence even has been doubted. But in the absence of a history either of rheumatism, or of chorea, or of the existence of pneumonia, of the specific fevers, of gonorrhœa, of the septic processes, or of any of the affections with which endocarditis is usually associated, and finally in the absence after death of lesions other than those due to malignant endocarditis, it is not unjustifiable to believe that primary endocarditis occurs.

The strict limitation of the endocarditis to the tricuspid valve, and to a limited contiguous portion of the ventricular wall, is also of comparatively rare occurrence. In the 209 cases of Osler's, in only 19 were the tricuspid valves alone affected. The great difficulties in diagnosis in the form of the disease which the patient presented are clearly seen in the clinical history of the case.

After the elimination of hemorrhagic variola and of typhus fever the symptoms and signs were not considered sufficiently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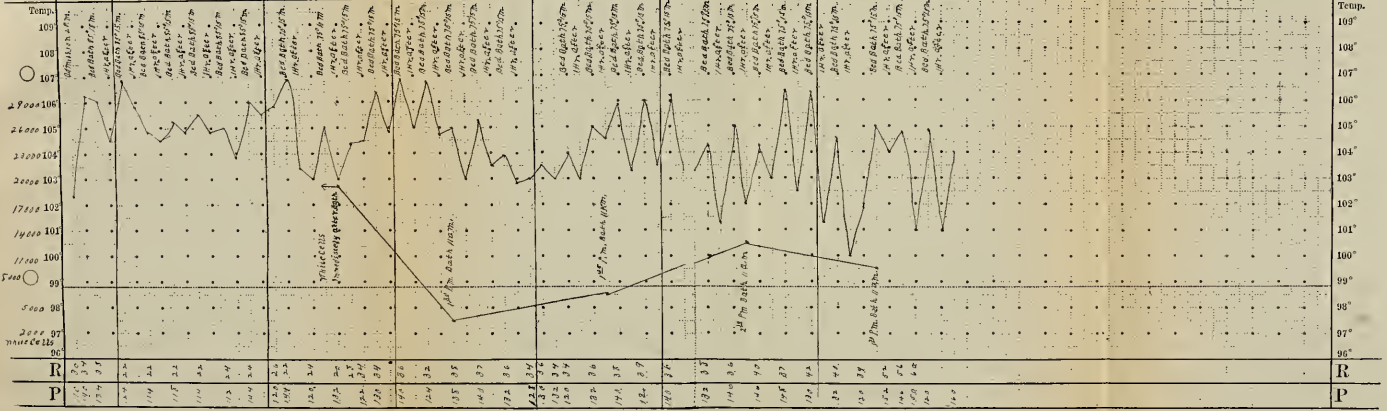
Name John C.

Date March 8, 1896

Date



characteristic to justify a differential diagnosis between a rare form of typhoid fever, cerebro-spinal meningitis, and malignant endocarditis.

The signs during life of valvular disease were insignificant; the only murmurs appreciable were such as might readily be produced by muscular incompetence and relative insufficiency—conditions common to acute diseases and high temperatures.

The absence of disease of the mitral valve indicates that the appreciable murmurs were of this nature.

NECROPSY.

J. C. *Autopsy*, March 10, 1896, thirteen hours after death.

The pericardium is normal. There is a patch of recent vegetation on one flap of the tricuspid valve and a similar patch on the contiguous portion of the ventricular wall. The other valves are normal. The weight of the heart is nine and one-half ounces.

On the surface of the lower lobe of the left lung are scattered a number of hemorrhagic infarctions, and in the interior of this lobe are several between one-fourth and one-third of an inch in diameter. In the lower lobe of the right lung are several large hemorrhagic infarctions, and there is some recent fibrin on the pleura at the base of this lung.

The stomach shows a good deal of post-mortem digestion and contains much mucus. In the jejunum are two ulcers about one-fourth of an inch in diameter with deeply congested borders. Peyer's patches are normal. The spleen is soft and dark; its weight is twelve ounces. The liver, pancreas, and peritoneum are normal. The weight of the liver is sixty-three ounces.

The adrenals are normal. The capsule of the left kidney is free, the consistence firm, the surface smooth, but shows a number of minute infarctions, some red, some white, scattered over the surface. On section the cortex is a little opaque, its markings fairly distinct. The right kidney is the same in all respects. Each kidney weighs four and one-half ounces. The ureters, bladder, and urethra are normal. The tongue, pharynx, œsophagus, larynx, and trachea are normal. The brain is normal, but its pia mater is injected and shows a few petechiæ.

Cultures were made from the heart, lungs, liver, spleen, and kid-

neys. From the heart, spleen, and kidneys were obtained pure cultures of staphylococci. Growths on agar and blood serum are faintly tinged with orange, their surfaces smooth and glistening, the edges somewhat irregular. The consistence of the growth is firm and very tenacious, like thick mucus. The growth in gelatine is slightly yellowish on the surface and gives very slight liquefaction at the end of a week. In milk, no coagulation is produced at the end of six days. The cocci stain well by Gram's method, and under the microscope are not to be distinguished from staphylococci pyogenetes aurei in size and arrangement.

The cultures from lungs and liver contain similar cocci contaminated with colon bacilli.

Microscopic examination of the heart vegetations shows that they consist almost entirely of cocci. Sections of the kidneys show emboli of cocci in some of the small vessels, surrounded by intense inflammation.

VIII.

INTRACRANIAL LESIONS THE RESULT OF TRAUMATISM.

By E. Eliot, Jr., M.D.

The brain is undoubtedly the most important organ in the body. It presides over the workings, and regulates the action, of those organs, upon the integrity of which life itself depends. It, therefore, is eminently proper that it should receive the greatest possible protection. This is furnished by the bony frame-work of the skull, which renders all blows of lesser degree harmless, and, in the majority of cases, even when the force received fractures the bone itself, the brain and its membranes escape injury. Additional protection is also afforded by the fact that, in not filling completely the cranial cavity, the brain enjoys a certain freedom of movement, in virtue of which mobility it is more apt to escape injury from traumatism. This is especially the case with children, where the brain fills less of the cranial cavity, proportionately, than in adults. The interesting fact remains, however, that at times, when the force has not been sufficient to have caused any kind of fracture, the violence may have been sufficient to have produced some dangerous intracranial lesion.

All these lesions can be divided into two classes, according to the nature of the traumatism :

1. Those due to a severe blow, with or without a wound of the scalp, with or without a fracture of the skull.

2. Those due to a penetrating gun-shot wound, necessarily associated with some fracture of the skull.

The lesions themselves, produced in one of these two ways, depend upon the nature and situation of the structure involved. In the bone, with nothing else than the external evidences of contusion, trauma may cause a fracture of the inner table of the skull or a fract-

ure of the base. As a result of this latter lesion, there is always more or less accumulation of blood between the dura and the bone.

In the second place, without any fracture, there may result from traumatism rupture of blood-vessels with hemorrhage, as follows:

1. Rupture of any meningeal artery, especially of the middle meningeal, with accumulation of blood between the dura and the bone.

2. Rupture of any vessel in the inner portion of the dura, resulting in the accumulation of blood in the subdural space. The previous existence of a chronic pachymeningitis of the inner layers of the dura predisposes to this condition.

3. Rupture of any blood-vessel of the pia-mater, with bleeding between the dura and the pia, or between the pia and the surface of the brain.

4. Rupture of any vessel in the sheath of a cranial nerve, with bleeding into the sheath of that nerve.

5. Rupture of a blood-vessel in the cerebral substance itself, with or without laceration of the brain-tissue.

6. Rupture of any vessel in or near the lining ependyma, with the escape of the blood into the ventricular cavity of the brain.

The rupture of blood-vessels in any one of the above situations from traumatism is more apt to occur in vessels already invaded by atheromatous changes, and it is more frequently seen in the vessels of the membranes than in those of the cerebral substance.

These hemorrhages may occur singly, but it is more usual for several to be associated together. In gunshot injuries, unless the course of the bullet has been deflected by the dura mater, penetration of the membranes, and of the brain itself, will cause all these conditions to exist simultaneously.

If the patient survives the original injury, the blood extravasated at the time of the hemorrhage may either be gradually absorbed, especially if it is small, leaving behind only a small amount of blood-pigment, or it may as gradually be transformed into a cyst. In the event of hematogenous infection, it may become an abscess. Other inflammatory conditions may develop, provided that the nature of the injury has been such as to allow of the introduction of germs into the cranial cavity. In fractures of the base of the skull, the line of fracture usually passes through a portion of bone, that inferiorly forms a part of the roof of the nasal fossa, or of the pharynx; thus

in the anterior fossa, fracture through the cribriform plate of the ethmoid would be compound, if the underlying mucous membrane were ruptured ; in the middle fossa any line of fracture, in passing through the middle ear, must allow access of air through the Eustachian tube to the site of fracture, if the mucous covering of the ear is ruptured. In the posterior fossa, fracture passing through the basilar portion of the occiput might easily be compound, if the underlying mucous membrane, forming the roof of the pharynx, were ruptured. In all such fractures, if, in this way, they are compound, infection, although it need not always occur (as the upper air-passages are usually free from germs), would necessarily cause septic inflammation of the membranes and sometimes of the brain itself. In the same way a penetrating wound of a bullet, by introducing infectious material into the cranial cavity, would probably lead to septic processes.

Without infection there sometimes develops a subacute inflammation of the ependyma, resulting in a marked increase in the fluid which the cavity of the ventricle contains, but without any change in the character of the fluid, except that it is slightly turbid from the fact that it contains a number of cells.

The symptoms which first occur in any case of cerebral traumatism are not to be ascribed to any definite pathological change. They are those of concussion. It is only after the lapse of a certain number of hours, which differs according to the nature of the case, that we can accurately judge of the gravity of the accident by the development of focal symptoms, or by the deepening of the unconsciousness. If the escape of the blood is slow, the patient may entirely recover consciousness, only to relapse into unconsciousness again, as the pressure of the blood is felt upon the cortex of the brain. If the escape of blood is rapid there will be no intervening period of consciousness.

Whether the escape of blood is slow or rapid, the symptoms that develop depend, in the first place, upon the pressure of the clot of blood upon the neighboring part of the brain. All extravasations of blood, in the early stages of their formation, irritate by their presence the function of the adjacent brain-tissue ; later on, when the amount of extravasated blood has largely increased, that function, which was first irritated, becomes paralyzed.

In the second place, symptoms develop due to the presence of

general cerebral compression. In laceration symptoms of paralysis also occur, due to the disorganization of brain-tissue from the escape of blood into its substance, as well as symptoms of irritation due to the pressure of such a cerebral clot upon the adjacent normal brain-tissue.

The range of such symptoms is therefore large, according to the position, the size, and the rapidity of formation of the clot, as well as to the presence or absence of cerebral laceration.

Provided that the patient survives the original injury and infection takes place, the symptoms of septic meningitis or of cerebral abscess may develop; such septic infection takes place, if at all, usually from the third to the fifth day after the accident, and is always of grave prognosis.

The following cases illustrate some of the lesions above described:

Case I. Probable Fracture of the Base of the Skull.

T. L., aged ten; schoolboy.

July 28, 1896. This evening patient fell five stories through an air-shaft, striking the pavement; brought to hospital in ambulance.

On admission, patient, though unconscious, could be partially aroused. Examination detected no paralysis of motion; there was, however, paralysis of sensation in all extremities. Examination of eyes negative. Severe contusions, with swelling of eyelids and supra- and infraorbital regions were present. There was a large lacerated wound inside of the left cheek, and one at left angle of the mouth. There was considerable bleeding from nose and mouth. There was also a hematoma, three inches in diameter, in the right occipito-parietal region. There was a simple fracture of the left humerus, and a Pott's fracture of the left leg. There were general contusions. Pulse 108, and of good quality; respiration, 28; temperature, 100.8° F.

Hematoma incised and clot enucleated. Skull, exposed at this point, shows no fracture. Scalp sutured. Arm and leg placed in ordinary splints.

July 29. Bleeding from the nose and mouth continues; delirium is constant and accompanied by marked restlessness. Respiration is feeble and shallow. Urine is passed involuntarily. No other focal symptoms have developed. Temperature reached 104.7° F.

this afternoon; respiration, 48; pulse, 160. Magendie, whiskey, and strychnine by the rectum.

August 1. Condition is somewhat improved. Temperature has gradually fallen to 100° F.; pulse, 102; respiration, 26. Patient is still very delirious.

August 5. His condition has remained almost unchanged. Temperature averages 100° F.; pulse is better, averaging 100; respiration, 22. The delirium has been controlled, partially, by Magendie, bromides, and chloral. Stimulation with whiskey and strychnine is still continued. Urine continues involuntarily.

August 7. Mental condition is improving, patient being rational at intervals. Urine and rectal dejections are still involuntary. Temperature averages 99.4° F.

August 12. Mental condition practically normal. Bladder and rectal reflexes also normal. Patient is quiet, and talks intelligently. Fractures in leg and arm have united in good position.

September 7. Since last note patient has had an uninterrupted recovery. Is discharged, entirely cured.

Case II. Fracture of the Vault and Base of the Skull.

E. S., aged eleven; schoolboy; referred to hospital by Dr. B., with the following history:

August 19, 1896. Two days ago patient fell from a window an unknown but considerable height, striking stone pavement with right shoulder and right side of head. Since then he has been a little stupid, but replies intelligently to questions. His mental condition has been growing gradually worse until to-day, when he became very restless, with a temperature at 101° F.

On admission he is moderately stupid, but is easily aroused, and answers questions. The eyelids of both eyes are bruised and ecchymosed. There is subconjunctival ecchymosis of right eye. There is a well-marked contusion of the right shoulder, and a hematoma, five inches in diameter, of the right occipito-parietal region. There is no paralysis, but a loss of both patella reflexes exists. Pupils are equal and dilated; they respond to light. Pulse, 56; temperature, 102° F.; respiration, 25.

An incision was at once made, under ether, over the hematoma and the skull exposed, showing a fissured fracture beginning at about the middle of the parietal bone and extending from this point forward and a little toward the middle line slightly into the frontal

bone, the anterior external edge of the fracture being depressed about the thickness of a finger-nail. The blood-clot was cleaned out and the scalp was sutured.

August 20. Irritable and restless; delirium alternating with stupor. No paralysis. Reflexes normal. Respiration irregular and sighing. Pulse, 74; temperature, 103° F.; respiration, 23; patient received eight minims of Magendie during the day, hypodermatically.

August 21. Periods of delirium are more frequent and attacks are more violent. No other change in condition. Owing to the increased gravity of the cerebral symptoms, it was thought advisable to still further explore the site of fracture and determine, if possible, the condition of the underlying portion of the brain. For this purpose, under chloroform, a button of bone, in the centre of the fissured fracture, was removed with a ¾-inch trephine. Dura pulsated and appeared normal; it was opened for about a quarter of an inch, showing brain-tissue pulsating and apparently normal beneath. A probe was passed anteriorly along the line of fissure between the dura and the skull, but showed no evidence of depression or fracture of the inner table. No blood-clot visible. Scalp closed with interrupted suture. Dressing.

August 22. Delirium less severe. Frequent involuntary rectal dejections. Magendie, minims 2. Highest temperature, 102° F.; pulse, 86 and of good quality.

August 23. Cerebral condition slightly better; delirium, now, not sufficiently violent to require Magendie. Involuntary dejections controlled by starch enemata. Highest temperature, 101° F.; pulse, 80.

August 24. Quieter, and mental condition is better.

August 26. Delirium much less; mental condition has gradually become clear. Other symptoms have subsided; patient is rational; rectum is continent; subconjunctival ecchymosis still persists, but is very much less marked. Highest temperature, 99.5° F.; pulse, 78.

September 1. Scalp wound healed; mind may now be said to have returned to its normal condition. Pulse, respiration, and temperature are all normal.

September 13. Patient is discharged, cured.

Case III. Tearing Fracture of the Base of the Skull. Sub-

piamatral Extravasation of the Blood. Subacute Ventricular Distention. Subacute inflammation of the Ependyma.

O. W., aged forty-eight; male; sculptor; admitted July 21, 1896.

Brought to the hospital this evening in the ambulance, having been found in an unconscious condition after a collision with a cab, while riding a bicycle.

On examination mental condition is one of semi-stupor; when roused, answers questions rationally, but has difficulty in remembering facts. Can recall nothing after leaving his house, three miles from the scene of accident. Reflexes are slightly diminished. No paralysis or anæsthesia present. Considerable ecchymosis about both eyes, and marked subconjunctival ecchymosis on the left side, with exophthalmos. Slight exophthalmos on the right side. Vision of right eye is normal; pupil reacts slowly. Vision of left eye is absent and pupil is fixed in moderate dilatation. There is ptosis on the left side.

Ophthalmoscopic examination shows right eye normal. The optic disc of the left eye is anæmic. No hemorrhages or laceration of the retina. There is paralysis of the levator palpebræ, and of all the muscles of the eyeball, except the external rectus.

Breathing is stertorous, when the patient is undisturbed. Pulse shows marked variations from time to time. Tension is normal. Left clavicle is fractured, and there are abrasions on the left side of the scalp. Temperature, 100.8° F.; pulse, 48; respiration, 14. Urine normal.

July 24. There has been steady improvement of general cerebral condition. No other focal symptoms besides those of the eye have developed. The mind is slowly becoming clear. Vision returning to the left eye. Ecchymoses are subsiding. Ptosis and subconjunctival ecchymoses persist, but are diminishing. Patient complains of pounding noise in the head, synchronous with the pulse-beat. Temperature reached 162° F. on the afternoon of the twenty-second, but since then has varied between normal and 100° F. Pulse has been regular, from 60 to 90 a minute.

August 10. Up to last night patient had steadily improved. Mental activity had steadily increased, and was then nearly up to normal. He has, however, never recalled the particulars of the accident, and remembers nothing after leaving his house until he became conscious in the hospital. He has been continually worried

and depressed, and is disappointed that he is making no greater progress toward recovery. The right eye has returned to normal; the left eye has regained power of vision sufficiently to recognize the color and form of objects; the pupil is normal and reacts to light. The subconjunctival ecchymosis has entirely disappeared. The ptosis, however, is almost as marked as at the time of patient's admission to the hospital. The pain in the head and the humming noise have grown less. The temperature and the pulse have been normal for the past week.

Late last night patient had a slight chill, lasting about two minutes, and with it severe head and back ache; temperature one hour later was 102.5° F.; pulse unchanged. Right pupil was contracted; the left pupil was again fixedly dilated. The tendon reflexes on the right side were markedly exaggerated. No paralysis or anæsthesia could be made out.

On the following morning, periods of delirium alternated with stupor until the afternoon, when consciousness again returned, and the general condition of the patient became as good as it was prior to the convulsion, with the exception of slight mental activity and increased depression.

August 11. Patient's condition remains the same as yesterday.

August 12. This morning patient is restless and nervous; there is pain in the head and back. About 5 P.M. there was a general convulsion, lasting one minute, followed by semicoma, and stertorous breathing, the latter lasting about two hours, the former persisting until the following morning. Temperature again rose to 102° F. while the pulse remained unchanged. No focal symptoms.

The patient was seen by Dr. A. J. McCosh, in consultation during the evening, and it was determined, that there should be no operative interference, unless the evidences of pressure persisted.

August 13. Consciousness this morning slowly regained, and for a time patient seemed brighter than for several days past; toward noon, however, he began to get more and more stupid, and finally coma ensued with stertorous breathing. Operation advised.

Patient's head shaved. Occasional whiffs of chloroform were sufficient to produce anæsthesia. A horseshoe flap of scalp and skull—made by gouge and chisel—was made and turned back on hinge, the line of fracture running a distance of two inches, from a point half an inch behind the left external angular process, horizon-

tally backward, the vertical diameter of the flap being about three inches. The dura was congested and bulged into the wound. There was a complete absence of cerebral pulsation. The dura was opened along the line of the upper margin of the flap. The brain beneath was congested and without pulsation ; its color and consistency were normal. The exploring needle was passed into the brain in all directions, four punctures being made in search of pus, but none was found. The index finger was then passed down along the base of the brain toward the apex of the orbit, following the posterior border of the lesser wing of the sphenoid bone, but no inflammatory adhesions or other abnormality could be detected. The flap was lightly replaced, and the dressing applied. Operation occupied fifty minutes.

August 14. Patient did not again recover consciousness after operation. Right-sided hemiplegia developed. He died about three o'clock in the afternoon.

Autopsy by Dr. O. Schultze.—Fracture of the skull through sella turcica. The frontal lobes, the operculum, and the lenticular nucleus on the left side showed signs of needle puncture. Some recent brain lacerations in the frontal lobe, also probably as a result of exploration at the time of operation.

There is an old subpiamatral clot one-quarter inch in thickness over the first frontal convolutions (more marked on the left side), and extending along the base of the brain to a median transverse line through the pons. The ventricles contain a large amount of bloody serum, the ventricular cavity being distended, and compressing the cortex of the brain against the skull. The vertebral and basilar arteries were markedly atheromatous.

In the sheath of the left optic nerve there was found an old blood-clot, extending from the chiasma to the eyeball; this was extensive enough to exert pressure on the optic nerve; a small clot similarly existed under the right optic-nerve sheath.

Case IV. Perforating Gunshot Wound of Skull, with Laceration of Brain-tissue and Hemorrhage.

W. S., aged twenty-one; tailor; male. Admitted August 3, 1894. Brought to hospital in ambulance this afternoon, immediately after having been shot in the head with a bullet of a 32-calibre revolver at short range.

Examination.—There is a bullet wound in the face just below the

circumference of the right orbit. There is considerable hemorrhage and some discharge of brain-tissue from the nose and mouth. Patient is conscious and rational. There are no focal symptoms at the time of admission. Pulse feeble and rapid. Soon after admission patient became dull and stupid, with alternating periods of marked excitability, when he would endeavor to tear the bandage from the wound. He did not completely lose consciousness at any time. The pulse became very slow (56) and full; respiration slow, with a tendency to be stertorous. Pupils unequally dilated. There was partial anæsthesia of the upper extremities. Muscular power of the left hand and forearm diminished. Unconsciousness deepening, evident symptoms of compression exerted over the right motor area.

Head shaved. A probe passed three inches into the bullet wound through the antrum of Highmore, in the direction of the base of the skull, failed to reach the bullet, which, passing through the upper part of the antrum, underneath the orbit, had evidently penetrated the cranial cavity near the middle fossa of the skull.

A horseshoe incision, with the convexity above, was then made over the right fronto-temporal region of the skull. The base of the horseshoe was three inches long, and ran in a horizontal direction backward, from a point half an inch behind the external angular process of the frontal bone. The scalp-tissues were retracted along the line of incision, and the cranial cavity opened with the gouge and chisel; the flap of bone and soft parts was fractured at its base and reflected backward. With the opening of the skull, the pulse became more rapid, but remained full, thus showing evidence of previous cerebral compression. The dura exposed, was tense and non-pulsating, and was of a bluish color, apparently from the blood extravasated beneath it. The middle meningeal artery was intact and had no venæ comites. The dura was incised in the same line as the bone and turned back. There was a considerable discharge of clotted blood, and of some lacerated brain-tissue. With the incision of the dura, the pulse again became more rapid, assuming its normal frequency. A number of bleeding points in the brain substance were ligated with very fine catgut. This apparently stopped the hemorrhage, and the evacuation of the clot relieved the pressure. A loose drain of iodoform-gauze was then placed in the

lacerated tract, and the flap of dura, bone, and scalp returned and loosely sutured.

A comparatively loose dressing supplied. There was considerable oozing from the field of operation for the first few hours following it, but the patient recovered rapidly from the effects of the anæsthetic, and showed no signs of compression.

August 4. 8 A.M.; temperature, 104.2° F.; pulse, 68; respiration, 20. 8 P.M.; temperature, 101° F.; pulse, 68; respiration, 20. Patient restless, delirious, and at times violent; this delirium was, however, easily controlled by twenty grains of bromide of soda, every four hours.

August 15. Notes from day to day show the patient's condition to be practically unchanged. He is so violent at times as to necessitate the free use of morphine and hyocine. For the past two days he has become more quiet.

The drain was removed August 10, and the wound presented a healthy appearance. The bloody discharge, which had continued up to that time, slowly disappeared.

The temperature continued between 100° F. and 103.5° F. since August 10, and then began to run a lower course, and to-day is very nearly normal; pulse about 90 at all times; it has not been above 100 at any time since operation.

August 20. Restlessness has gradually subsided, and now he is quiet, and his mind is normally active. The wound is healed.

September 3. Discharged from the hospital in possession of all faculties, and complete muscular power. The bone-flap has united with the surrounding part of the skull.

November, 1896. Two years and two months after his discharge from the hospital patient is well in every way except for occasional neuralgic pains in the head.

The treatment of all obscure cranial lesions due to traumatism is based upon the same principles. Such measures may be divided into the conservative and those of a radical or operative nature.

The conservative treatment includes proper attention to the diet, the bowels, etc., together with absolute rest in bed until the cerebral functions of the patient shall have been entirely restored. At the same time every measure should be taken to prevent any possible source of exogenous infection; all wounds of the scalp, and all cavi-

ties lined by mucous membrane, into which a fracture of the base of the skull may have penetrated, must be carefully and frequently cleansed with bland antiseptic solutions. Further than this the treatment is entirely symptomatic, the patient receiving enough morphine to insure absolute rest.

Conservative treatment is contra-indicated, and operative interference is demanded :

1. When the development of any symptom, after the initial symptoms of concussion have subsided, indicates localized pressure upon any part of the cortex of the brain. This necessitates the immediate exposure and exploration of that portion of the organ affected, which can be accomplished either by trephine or by the raising of an osteoplastic flap.

2. Unfortunately, the surgeon cannot always be guided by the development of any focal symptom. Under such circumstances, operation is indicated by an unfavorable change in the character of one or more of the following symptoms :

If the delirium is more violent, if the periods of delirium become shorter and alternate with well-defined periods of stupor ; if the temperature shows a tendency to a higher course ; if (most important of all) the pulse of the patient shows a tendency to become less and less frequent, while the tension increases, under such circumstances, even in the absence of any focal symptom, the surgeon is justified in making an exploration at that point where the original injury was received.

Unfortunately, operative interference is not always attended by success. Failures must be attributed—

1. To the occasional inaccessibility of the lesion. Thus, in case of hemorrhages, although clots over the convexity of the brain can always be removed, those at the base cannot be safely reached.

2. Failure of operative interference is, at other times, due to a multiplicity of lesions, thus making any operation necessarily incomplete. All cases, where the patient passes into coma with all the symptoms of severe compression, and where death results a few hours after the accident without the patient regaining consciousness, are usually of this category. In all such instances, operation, although it usually fails to give relief, may yet in exceptional cases prove successful and save the life of the patient.

Operative interference may also be indicated later on for the

relief of any beginning septic condition; if a meningitis develops, the free exposure of the meninges will sometimes prevent the further spread of the infection. In the event of the formation of an abscess of the brain, it is always proper to remove sufficient bone to provide for the free evacuation of the pus, and the thorough drainage of the abscess cavity.

IX.

A CASE OF PULSATING EMPYEMA.

By Andrew J. McCosh, M.D.

G. V. E., aged thirty-seven. Brother died of pulmonary tuberculosis, otherwise family history good. No alcoholic, syphilitic, or rheumatic history. Five years ago pneumonia followed by pleurisy with apparently perfect recovery; at same time fistula-in-ano cured by operation. General health fairly good until December, 1895, when he noticed shortness of breath on exercise. This gradually increased, so that by the middle of January he was obliged to give up work. Had not been confined to bed, but felt that he was losing flesh and strength, suffered from slight cough but no expectoration and no night-sweats. About the middle of February he noticed a small pulsating swelling on the chest-wall, half way between the left nipple and middle of the clavicle. This slowly increased in size. Loss of flesh and strength continued with increased difficulty in breathing. In May he was seen by Dr. Edward G. Janeway, who diagnosed pulsating empyema. A needle passed by him into the left pleural cavity withdrew thick pus. This was examined by Dr. Theodore C. Janeway, who found with the microscope tubercle bacilli; and a guinea-pig which he inoculated died two months later of general tuberculosis. Dr. E. G. Janeway recommended operation and sent him to the hospital.

Admitted to the surgical division May 28, 1896.

Temperature, 98° F.; pulse, 120; respiration, 32. Patient anæmic, poorly nourished. Considerable dyspnœa on exertion. On examination there was seen on the anterior surface of left side of chest a swelling somewhat circular in shape, about four inches in diameter. There was marked pulsation in this swelling, and this was evident to the eye even at a considerable distance. On palpation it was so distinct that the impulse was similar to that of an aortic

aneurism. Pulsation was synchronous with the cardiac impulse and was more marked on expiration. Swelling in greater part reducible by strong pressure. Marked pulsation both to sight and touch of intercostal spaces of left side of chest. Flatness, loss of fremitus and of auscultatory signs over entire left chest, except at apex of lung, where there is a tympanitic note.

Heart pushed to right of sternum, so that apex-beat was situated one inch and a half to right of that bone, and cardiac dulness extended three inches in the same direction.

Operation.—Chloroform. Incision two and a half inches long over eighth rib in midaxillary line of left side. Periosteum reflected. Pleural cavity opened by small puncture between eighth and ninth ribs, and thick, creamy pus allowed to run out slowly. The pus was so thick that it flowed out with some difficulty. No foul odor. When two quarts had been evacuated, a portion of the eighth rib, one inch and a half in length, was excised. The patient was then turned on left side and another quart or more of pus escaped, its egress being still further aided by elevation and depression of the patient. Irrigation with hot-salt solution, which brought away thick masses of coagulated pus and fibrin. As the opening was not large enough to afford free exit to these masses, a corresponding portion of the ninth rib was excised. Internal surface of pleura covered throughout with a layer of membrane thicker than blotting-paper. Free washing with salt solution, but this was not sufficient to dislodge the membrane, and therefore the surface of the pleura was thoroughly scrubbed with gauze sponges till the irrigating fluid came out comparatively clear. Two large drainage-tubes and some strips of iodoform-gauze inserted for drainage.

As soon as the fluid was evacuated the heart began to slowly return to its normal situation, and when the operation was completed the apex-beat was felt midway between the sternum and left nipple. The pericardial sac could at first not be felt by the exploring finger, but at the close of the operation it was within reach.

In order to test whether or not the pulsation had been due to the character of the fluid, the chest was filled with salt solution, the opening being temporarily closed, when the pulsation returned as vigorously as before operation.

Comparatively little shock followed. Considerable oozing from wound.

May 29. Highest temperature, 99¼° ; pulse, 90; respiration, 26. Much relieved.

May 30. Highest temperature, 100° F. ; pulse, 100 ; respiration, 26. Profuse discharge from chest.

During the following week the temperature ranged between 99½° F. and 101° F.; pulse, 90 to 100 ; respiration, 24 to 30.

June 3. The tubes were removed, the chest irrigated with salt solution, and the tubes replaced.

During the next fortnight irrigation every second day. Considerable discharge of pus.

June 9. The temperature became normal, and never again rose above 99½° F. Pulse remained about 80, and respiration between 24 and 30.

After June 18, daily irrigation. Cavity contained forty-two ounces of salt solution. Daily discharge of pus, three to four ounces. Patient out of bed on June 13. Rapid gain of strength, shortness of breath disappearing. As the patient desired to go to his home in the country, he was discharged July 13. The cavity at that time contained thirty-eight ounces. The discharge of pus was between three and four ounces in the twenty-four hours.

PATHOLOGIST'S REPORT BY DR. THACHER.

Microscopical Examination of Sections of Membrane.—No structure, amorphous material.

Microscopical Examination of Smears from the Pus.—No tubercle bacilli found ; no bacteria of any kind.

Culture on Blood-serum.—Resembles staphylococcus pyogenes albus.

November 15. Dr. George E. Titus, of Hightstown, N. J., writes that the progress of the case has not been satisfactory. The patient has lost rather than gained strength. His evening temperature is between 100° and 101° F.; pulse, 90 to 110; the lung is not expanding ; I have advised him to return to the hospital for the purpose of undergoing either Estlander's or Schede's operation.

In this case the question at once arises, how long had the empyema existed ? Was it the direct result of the pleurisy and pneumonia from which he had suffered four years previously, or was it of more recent occurrence (five months) ? He claims that he felt per-

fectly well until December, 1895. If this is true, the onset at this time must have been insidious. If the empyema followed the pleurisy of four years previously, it is singular that his general health should not have suffered during this period. If the empyema is tubercular, as seems probable, the five months' duration seems more probable than the four years, considering the condition of the patient during this period.

The number of reported cases of pulsating empyema is very limited, and that condition is still more rare where a pulsating thoracic hernia of the purulent pleural effusion occurs, the so-called empyema necessitatis. The explanation of this condition probably is as follows: A local necrosis of a portion of the pleura having occurred, the pus, being no longer confined by this tense membrane, bulges out the soft parts which cover the chest, and finally forces itself through the ribs, forming an external tumor. The muscles stretch, become very thin, and may gradually give way, thus leaving the skin as the only covering of the hernia, and, finally, this latter structure may become gangrenous, and complete perforation of the chest-wall take place.

Many theories have been advanced to explain the pulsation of certain empyemas. Not one of them, however, seem to give a satisfactory explanation. Cases of pulsating pleurisy where the fluid has been serum have been reported, and in a few cases the pulsation has been on the right side. In the case just reported, the pulsation was equally distinct when the chest was filled with salt solution, so that apparently the high specific gravity of the fluid was not the cause of the pulsation in this patient.

X.

INTUSSUSCEPTION IN AN INFANT OF SEVEN MONTHS —HIGH INJECTIONS—RECOVERY.

By W. P. Northrup, M.D.

The mother, with the child, dropped into the office of their family physician, Dr. L. K. Neff, at his office-hour, 1 to 2 P.M., to arrange for vaccinating the baby. So far as the mother knew, or the doctor noticed, there was nothing amiss with the child. At 3 P.M. the baby went to sleep, awaking with a cry at 5 P.M. "It had the colic," so it was said, and for that was given brandy, fennel tea, and water; after these doses the child vomited several times. The physician was called, arriving at 6 P.M. He discovered a sausage-shaped tumor, three inches by three-quarters of an inch, lying along the margin of the liver. No food was given during the night, but the baby vomited twice. Bowels did not move.

On the following morning I saw the case in consultation and found the sausage-shaped swelling reported by Dr. Neff in the right hypochondrium, easily felt, corresponding to the hepatic flexure of the colon, three inches by three-quarters of an inch. The tumor began deep in the right flank; the left extremity was about the median line; a sharp shoulder could be felt by the end of the finger. The child lay in a stupor, relaxed as though under an anæsthetic. No amount of manipulation caused change of countenance; the abdomen was relaxed so the "sausage" could be mapped out, rolled about, and picked up between the thumb and fingers. Physical examination otherwise disclosed no abnormality; no digital exploration of the rectum seemed indicated, and on account of the age of the child was not made.

The diagnosis of intussusception was agreed upon. As yet there had been no passages from the bowel later than two normal movements in the morning before the first symptoms. The vomiting, at first, following fennel tea brandy and water, later, occurred again twice in the night. The symptoms and signs were two—

pain and sausage-shaped tumor. Stupor and relaxation with pallor were very pronounced, but are not here recorded as characteristics of intussusception.

For purposes of corroborating the diagnosis, a simple warm-water enema was advised; if this brought away the characteristic passages of intussusception, the physician was to try high injections, and if not by this method successful in reducing the telescoped intestine, to operate.

An hour had not elapsed when the telephone rang, and Dr. Neff announced that he had scarcely begun the injection when blood freely escaped from the rectum, and the diagnosis could require nothing further.

The doctor removed the patient to hospital at once. In two hours the patient was in the operating-room: present, Drs. McCosh (officiating surgeon), Briddon, Thornley, Hawkes, Northrup, Neff (family physician), Dr. O'Dwyer and others as guests.

Gentle irrigation of the rectum brought away free blood. High injection attempted with water 110° F.; pressure, five feet. Soft catheter passed three to five inches within the sphincter; no effort was made to carry it higher. The hips were elevated and the buttocks compressed about the rectal tube. No anæsthetics were required; the baby continued drowsy, relaxed, pale, and seemingly anæsthetic. As the water slowly crept from the splenic flexure toward the sausage-shaped mass accumulated behind the constriction, it formed a tumor to the right of the median line, a tumor to be easily felt and seen. This tumor, after a little time, a pressure of a five-foot column of water being continued, travelled more and more to the right, and under the hand seemed all at once, with a gurgle, to flatten out and disappear. The general condition of the child was unchanged. No further evidence of tumor being present, the child was returned to the medical ward for further observation.

9 P.M. On examination, after the water had been absorbed, the abdomen had become collapsed. There seemed to be a tumor, smaller, in the same location. It was believed the intussusception either had not been entirely reduced in the first place, the presence of so much water having obscured the condition, or that the intussusception had returned.

At 10.30 P.M., eight and one-half hours after the first injection, the child was allowed to nurse from its mother. About this time blood and mucus came away in two passages.

On the morning of the next day the baby was again nursed; it immediately vomited. At 11.45 A.M. it passed bloody mucus; more mucus passed in the afternoon. Condition remained nearly the same, perhaps, mentally, a little brighter.

Evidences of tumor were doubtful. There was a suggestion of a tumor to the feel; if tumor, it was not as it originally presented itself. Child nursed every three hours. During this day the temperature was 99½° to 100° F., rectal; pulse, most of the time, 124 to 128.

On the second day in hospital the general condition was less favorable; abdomen was rigid, somewhat distended; stupor, relaxation, pallor, were more marked; temperature reached 103° F.; pulse, 142. This was forty-eight hours from the first appearance of symptoms.

Indications for prompt relief were pronounced. Dr. McCosh, advising injections, they were administered as before, under continuous, prolonged, gentle pressure. Again a cutting operation was meditated if the injection did not relieve. The condition of the child at this moment brought out the opinion from some present that injections were unsafe, and abdominal section offered better results. The medical men present favored the view of Dr. McCosh that injections conducted with the cautions observed in the former attempt at reduction were justified and preferable.

The second injection left the abdomen full of water, with no definite evidence of the condition of the intussusception. The pressure was rather less than five feet, was held rather longer than the first, till, in fact, the entire abdomen was apparently filled. The child was allowed absolute quiet for six hours, when the surgeons and physicians were again to meet and consider the necessity of an immediate abdominal section.

At the designated hour the meeting took place and in the operating-room, so little confidence had we that the second injection would accomplish what the first had not. At the appointed time the nurse appeared but without the child, and reported. Her report was embodied in the contents of a diaper and was a movement containing, among the mucus, much normal fecal matter, evidence that the intussusception was reduced. That night the baby slept well, nursed at regular intervals, and in the morning was sent home with its mother, *cured*.

It has remained perfectly well ever since, now seven months.

XI.

UNCLASSIFIED SURGICAL CASES.

By Chas. K. Briddon, M.D.

Case I. Recurrent Carcinoma of Neck following Carcinoma of Tongue. Excision of upper part of Common Carotid, of part of External and Internal Carotids, one inch above their Origin, corresponding Veins, and one inch of Pneumogastric Nerve, and part of Wall of the Pharynx.

D. B., aged twenty-four; married; carpenter; Scotch.

Family History.—Entirely negative. His present trouble began in January, 1895, previous to which time patient had always enjoyed good health. He then noticed a small fissure on the left side of his tongue. It came on gradually, after no apparent cause, grew slowly, and, with the exception of occasional irritation from his teeth, afforded no symptoms. On August 28, patient sought hospital advice. The following physical examination was made: He showed no signs of emaciation. There was a small fissure in outer edge of tongue on left side, surrounded by a slight area of induration. No glandular enlargement detected. A specimen from the growth was examined and found to be carcinomatous.

Radical operation was advised, with thorough removal of adjacent glandular structures, if necessary. Kocher's method of excision was decided on.

August 28. *Operation.*—Incision four inches in length parallel to, and just below lower margin of, jaw on left side. Lingual artery tied in left digastric triangle. A few lymphatic glands, somewhat enlarged, were removed. The sublingual, and a portion of submaxillary, gland, although normal in appearance and size, were excised, on account of proximity to growth in tongue. Floor of mouth was now opened into, tongue drawn out by a silk ligature passed through its tip. A wedge-shaped piece, containing fissure and area of induration, was removed from left side, leaving right half of tongue prac-

tically intact. A drain of gauze was passed through wound into mouth; microscopic examination of parts removed showed, as before, typical epithelioma in tongue, but no evidence of malignant invasion in glands.

Patient made an uneventful recovery from operation; wound was dressed daily, Whitehead's solution used as local application.

On October 12, patient was discharged from hospital with wound entirely healed. He was kept under monthly observation. About January 1, 1896, a lump, the size of a marble, was noticed just under the inferior maxilla on left side. Two weeks later it had doubled in size. There was no evidence of recurrence *in loco*.

An immediate operation was advised, and performed February 5. There is a large mass just under lower jaw on left side, adherent to thyroid and all the deeper structures of neck. It has no distinct outline, but shades off into surrounding structures.

An elliptical incision was made, excising the cicatrix of previous operation, which was adherent and evidently infiltrated with carcinomatous tissue. From the centre of this, incision was prolonged downward and outward, parallel with the anterior border of the sternomastoid muscle, exposing the platysma, and after incision of this structure, the sternomastoid itself. The omohyoid was now exposed anteriorly, and the sheath of the vessels opened, both artery and vein appearing in the wound. The artery was ligated in the angle between the two muscles, and a temporary ligature passed around the vein, which was subsequently tied. The mass, consisting of a number of glands inseparably united to each other and the adjacent structures which were also found adherent to the thyroid cartilage and hyoid bone, and above extended into the parotid. This was now excised, the external carotid and internal jugular vein being divided as they entered the parotid gland and tied. The internal carotid was also divided one inch above bifurcation, the mass being adherent closely to the vessels. In the subsequent separation of the mass from the sides of the hyoid bone and thyroid gland, it was found necessary to excise a portion of the lateral wall of the pharynx to which they were adherent, just above the greater corner of the hyoid bone. The longitudinal rent was sutured with continuous silk. The mass of glands and the parts to which they were adherent comprised the upper portion of the common carotid, an inch of the internal carotid, an inch and a half of the external carotid with its

branches, the corresponding portion of the internal jugular vein, and about one inch of the pneumogastric nerve, also the hyo-glossus and myohyoid attached to the hyoid bone, and the lymphatic tissue and glands. The hemorrhage was considerable, especially the venous, which was oozing, and the patient took the anæsthetic poorly throughout the entire operation. All ligatures used were of catgut. Flaps of wound were brought together by interrupted sutures, a tampon of iodoform-gauze being introduced down to the pharyngeal wall.

Patient rallied well from operation. For forty-eight hours he received nourishment by rectum. The wound was dressed on the second day, and daily afterward. Fluids given by mouth on the second day appeared in the wound. This leakage of food through the wound persisted for one week, when it gradually subsided. Patient sat up out of bed, and walked on the fourteenth day after operation. He has been unable at any time to speak above a hoarse whisper. Microscopic examination of parts removed showed diffuse carcinomatous involvement. He left the hospital one month after the operation, and his condition is at present excellent.

Laryngeal examination made March 10, 1896, by Dr. Simpson: Epiglottis much reddened and œdematous, especially in lingual side. Interior of larynx very hyperæmic. Right side of larynx moves freely. Absolute immobility of left side. Left vocal cord is stationary in median line, with slight swelling of left side of larynx. Phonation is produced entirely by right cord coming over to meet left stationary cord. Great amount of secretion collected in lower pharynx.

Case II. Adenoma of Thyroid Gland. Thyroidectomy.

J. L., aged twelve; schoolboy; American.

Family History.—Negative.

Previous Personal History.—Patient was in good health until five years of age, seven years ago, when he contracted a cough, from which he has suffered off and on since. With the exception of pain in his right side, this was the only pulmonary symptom. He remained in comfortable health until May, 1893, when he experienced some digestive disturbance. In August, 1893, was admitted to the Presbyterian Hospital, with a diagnosis of chronic nephritis. His physical examination made then was as follows: Fairly nourished, anæmic; over right lung at apex, and over the lower lobe, are

old adhesions; heart regular; extremities slightly œdematous; urine contained thirty per cent. of albumin and numerous casts. He remained under treatment for two months, and was then discharged improved. At the time of his leaving the hospital his urine contained only a trace of albumin and no casts. From this time on he remained in fair health until present illness, seven months ago. A tumor the size of a walnut was then noticed for the first time in his neck, just to the right of the thyroid cartilage. It was hard, painless, and movable on deeper structures. There was no change in the size of tumor until last August, when the patient was treated by galvanism. Following this treatment, it rapidly enlarged. He has had no constitutional symptoms; no chills, fever, or sweating, and he has not lost appreciably in flesh or strength.

Physical Examination on admission, November 26, 1895, as follows: Patient well nourished and not anæmic; entire right chest shows signs of fibroid consolidation of right lung; on inspection a large lobulated, ovoid mass on right side of neck; its long axis running downward and inward, extending from angle of jaw above to the sternal notch below; this mass passes across the median line of the neck just below the thyroid cartilage, to expand on the left side into a small globular tumor the size of a lemon; on the right side the external jugular courses down over the posterior portion of the tumor; the whole mass, with its connecting isthmus, rises and falls equally in the process of deglutition; palpation painless, elastic in consistency, fluctuating and soft, the sternomastoid passing over its surface on the right side posteriorly; no laryngeal pressure, symptoms, or dyspnœa; needle inserted withdraws a very small amount of thick, cystic fluid.

December 4. *Operation.*—Chloroform anæsthesia; an incision reaching from the lower portion of the parotid gland above to the sternal notch below, parallel to sternomastoid; dissection carried down to surface of tumor, the omohyoid, sternothyroid, and sternohyoid muscles being divided over the prominent part of tumor; its surface exposed, of a dark-bluish color, was covered with large veins, and was evidently the enlarged thyroid in a cystic condition. It was separated at first above and internally down to isthmus, then below inferiorly in the same way, being lifted out of its bed in front of the carotid sheath, the internal jugular and common carotid being exposed. This experience placed the inferior thyroid vein and artery

on the stretch, and these structures were tied *en masse*, the recurrent laryngeal nerve being seen and separated from the tumor in its position between the trachea and œsophagus. The superior thyroid vessels were clamped and tied in the same way. A strong ligature was placed around the isthmus, which, however, proved diseased and soft, allowing the ligature to cut through its substance. The left lobe was left *in situ*, although somewhat enlarged. The wound was closed by interrupted sutures of silk, and drained in its lower portion with gauze.

Patient made a good recovery from operation. Wound healed throughout by first intention. Sutures were removed on the fifth day after operation. A slight sinus persisted in the lower portion. This completely closed three weeks after operation, when patient was discharged cured.

Pathologist's Report on Tumor.—On gross examination: Oval, 5 in. × 3 in. × 2 in.; smooth; color, dark-brownish purple. On section, a mass of small cysts, mostly fluid, largely bloody, some yellow and some clear.

Microscopical Examination.—The structure is glandular, but the alveoli are much elongated, and the connective-tissue trabeculæ very thick. Lining cells are flattened. THACHER.

The patient was again in the hospital in the summer of 1896. His appearance was then slightly suggestive of myxœdema. The lips were somewhat thickened and prominent, and the tongue was also apparently enlarged. His general health had suffered markedly since his discharge from the hospital, and he was thin and anæmic.

The left lobe of the thyroid gland had increased in size till it occupied the whole of the area from which the right lobe had been removed, as well as an area about half as large, to the left of the median line. The new growth was apparently of the same character as that previously removed, but, inasmuch as it was causing no symptoms, and his general condition was unpromising, it was not considered proper to interfere.

Case III. Tubercular Kidney. Nephrectomy.

M. S., aged twenty-nine; married; American.

Family History.—Good.

Previous Personal History.—Patient was perfectly well until four years ago, when she began to suffer from attacks of pain resembling

renal colic, beginning in the right lumbar region, and radiating into the lower abdomen. The frequency and severity of these attacks caused her to seek surgical relief, and she was operated upon in the Long Island City Hospital two months later, a diagnosis of renal calculus having been made. It was necessary to abandon this operative procedure on account of her sudden collapse. After this a discharging sinus persisted in the line of incision, and pus was noticed in her urine for the first time. The severity of her pain resulted in the formation of the morphine habit, and patient has occasionally taken fifteen grains in the twenty-four hours. She remained in this condition until two years ago, when an abscess formed in the loin. This was opened and she experienced some relief. The wound has discharged continually since, and while her pain is largely controlled by large doses of morphine, she seeks relief for failing health.

An examination made on admission showed the patient considerably emaciated and anæmic. Just below the right intercostal margin, in the posterior axillary line, is the site of an old cicatrix. There is a second one at the same level along the anterior border of the right erector spinal muscle. In each of these cicatrices is a discharging sinus, four to six inches deep, running backward in the direction of the kidney.

Urine Analysis.—Sp. gr., 1015; trace of albumin; alkaline; small amount of pus; no casts; tubercle bacilli not found; no increased frequency of micturition; daily quantity about thirty ounces.

On account of her rather rapidly failing condition, an operation was advised at once. For three days previous to this she received full doses of morphine, about three grains daily, and free stimulation. Operation on May 29. Nephrectomy; anæsthesia was established by ether. A vertical incision was made in the site of the posterior sinus four inches long. This was enlarged by a transverse cut from its middle to its anterior sinus. On account of the extent of the inflammatory process no structures could be recognized. Upon deepening the incision an abscess cavity was opened, from which nearly a pint of foul-smelling pus, tubercular in appearance, was evacuated. The finger introduced, detected an irregular cavity about three inches deep and six inches in a vertical direction, extending upward to the diaphragm. Just posterior to its lower wall a small kidney could be felt. It was so densely adherent to the inflammatory mass that any dissection was absolutely impossible, nor could any-

thing in the way of clamps or ligatures be used for the same reason. It was, however, after some difficulty, torn from its socket of inflammatory tissue by the operator's hand. The only hemorrhage encountered was a moderate oozing from the wall of the cavity, which was irrigated with salt solution, and packed with iodoform-gauze. The operation was performed in fifteen minutes. Following the operation patient made a very rapid and satisfactory recovery. The wound was dressed on the second day, and afterward daily. Creolin irrigation was employed at first. About two weeks later Villate solution was used, and under this treatment the discharge rapidly decreased, and the wound assumed a healthy appearance. Her morphine was gradually diminished. For the first week after she received from 100 to 150 minims of Magendie during the day.

June 30. Her daily dose is 50 minims. Her general health has markedly improved.

October 15. Patient in excellent condition. She still uses morphine regularly, but in diminished quantities.

Pathologist's Report.—Specimen consists of a kidney mottled on the surface with white spots, and with softened and cheesy areas on section. Also some fragments of tissue like lymph-nodes with softened centres.

Microscopical Examination.—Typical tubercular inflammation.—THACHER.

Case IV. Laparotomy for Perforation of Intestine following Typhoid Fever.

S. K., aged eighteen ; single ; Russian ; pedler.

Admitted October 9, 1895.

Died October 11, 1895.

Never before had an attack of abdominal pain. Nine weeks ago he went into a hospital in Galesburg, Ill., and was there for five weeks with typhoid fever ; he was discharged from that hospital seventeen days after his temperature had fallen to normal, that is, about four weeks ago.

Present Illness.—Three nights ago, while travelling, he was seized with severe abdominal pain ; he managed to reach the home of some friends in this city, and went immediately to bed. The pain continued and great abdominal tenderness developed, more particularly marked just above the umbilicus, extending afterward over re-

mainder of abdomen, for which poultices and hot-water bags were applied, but with no relief. The pain has never been localized. He has had no vomiting. His bowels, previously regular, did not move for three days until this morning, when he had several loose, watery movements. For three days he has taken only a small amount of fluids.

He was brought in on the hospital ambulance.

On Admission.—His abdomen is slightly distended. Tenderness is exquisite all over abdomen ; no deep palpation can be made. The abdomen on percussion is tympanitic over the upper part, and somewhat dull below. Respiration is rapid, shallow, and thoracic. Pulse rapid, small, and of moderate tension. Face distressed. Tongue heavily coated. Temperature, 104° F. ; pulse, 130 ; respiration, 32.

During the day and evening following admission his condition has become much worse. Tenderness is greater, distention more marked, pulse small and of greater tension. At 8 P.M. his temperature fell to 100.8° F., and he seemed considerably better.

October 11. This morning all his symptoms are worse ; temperature is 104° F., and pulse 128, and of poor quality.

11 A.M. operation.

Asepsis, ether. An incision four inches in length was made in the median line just below the umbilicus, and carried into the peritoneal cavity. The small intestine presented in the wound, covered here and there with patches, thick and inflammatory exudate. There was a considerable amount of thin, ichorous pus in the peritoneal cavity. The intestine was drawn through the wound, and carefully examined, beginning with the cæcum and working upward. The appendix was found to be normal. About nine inches above the ileocæcal junction a perforation was found situated opposite to the mesenteric attachment, from which the thin, feculent contents spurted a considerable distance. No other perforations were found. The perforation was drawn into the wound, and closed with a double layer of Lembert sutures of fine silk. The peritoneal cavity was washed out with a large amount of normal salt solution, a tampon of iodoform-gauze carried down to the perforated gut, and brought out of the wound for drainage.

In spite of all stimulation patient rapidly failed, and died at 10.45 P.M.

Autopsy showed the perforation tightly sealed, and no other perforation, but the Peyer's patches of the lower ten inches of the ileum were markedly ulcerated.

The point of chief interest in this case is the time that elapsed between the fall of temperature to the normal in a case of typhoid fever and the perforation due to ulceration. Three months before admission he was under treatment for a period of five weeks for typhoid, and was discharged seventeen days after his temperature had fallen to the normal, and four weeks before entering the Presbyterian Hospital, during which six weeks he was following his occupation as a pedler, and yet, according to the pathologist's report, Peyer's patches were found markedly ulcerated.

XII.

A REPORT OF SIXTY-SIX CASES OF APPENDICITIS

Occurring in the Service of Dr. McCosh, at the Presbyterian Hospital, during the Two Years' Interval from December 1, 1894, *to December* 1, 1896.

By Forbes Hawkes, M.D.

Remarks by Dr. McCosh.—The following facts concerning all cases of appendicitis which have been treated in my wards during the past two years have been derived from the hospital records by Dr. Hawkes, and have been tabulated and classified by him in a most elaborate and careful manner. In reading these statistics it should be borne in mind that these patients have been treated in a general hospital, where, as a rule, the milder cases of the disease are not encountered. With the exception of a few of the recurrent cases the patients were brought to the hospital by ambulance, and generally when the chance of recovery without surgical interference had been abandoned, and consequently in the majority of cases after the most favorable moment for operation had passed. The condition of many was most unfavorable ; indeed, several were sent to the hospital merely for purposes of euthanasia. The absence of mild cases will explain the large percentage of operations.

I have never felt that all cases of appendicitis should be subjected to operation. A certain number recover without surgical interference, and recover permanently. It is to me one of the most difficult problems in surgery to decide the propriety of, and the most favorable moment for, operation. The closest observation, and a considerable experience, is needed. The general aspect of the patient is often of more value than individual symptoms. Temperature is unreliable, and so is, often, the pulse, and even vomiting and tympanites may be absent until general septic peritonitis is far advanced.

In regard to the treatment of the stump the simple method to be

TABULATED LIST OF SIXTY-SIX CASES OF APPENDICITIS OCCURRING IN THE SERVICE OF DR. A. J. McCOSH, AT THE PRESBYTERIAN HOSPITAL (NEW YORK CITY), DURING THE PERIOD OF TWO YEARS, DECEMBER 1, 1894, TO DECEMBER 1, 1896, BY FORBES HAWKES, M.D.

TABLE I.—THE FIFTY-SEVEN CASES RECEIVING OPERATION

Case Number and Initials	Age.	Occupation	Type of Disease.	Complications	Date of Date Operation	Operator	Result.	Pain	Previous Illness and Letter History	Condition of Bowels.	Chill.	Pulse.	Vomiting.	Bladder Symptoms.	Previous of Tumor and Letter Symptoms.	Treatment and Entrance.	Number Respiration.	Temperature.	Temperature, Pulse, Respiration, Pain and Tenderness at Admission.	Urine.	General Condition of Patient at Admission.	Other Signs.	Time after Beginning of Pain of Admission.	Assistants Used.	Incision.	Condition of Abdominal Wall and Peritoneal Appearances.	Appearance of Intestine and Appendix and Relation to Adhesions.	Adhesions.	Condition of Appendix and Peritonitis.	Contents of Appendix.	Appendix Free or Adherent.	Length of Appendix.	Treatment of Stump.	Sutures.	Condition of Pelvis as to Drainage.	Drainage	Behavior of Wound	Date of Pain	Left Hospital on	Condition of Case on Leaving Hospital.
1. L. C. f	19	Schoolgirl.	Chronic recurrent, 30 attacks		Dec. 8, 1894	Dr. A. J. McCosh	Recovered	Moderate	Eight days from first attack.	Regular	No	No	No	No	Abdom. right iliac fossa, from first attack. Pain, tenderness, rigidity.	Right iliac fossa, very severe	18	Slight	Temp. 103 F., pulse, 108, Resp. 24. Pain and tender extending right iliac fossa.	Negative	Acute peritonitis		2 days.	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.									
2. C. C. f	28	Actress	Acute, 10 attacks						Abdom. pain, right iliac fossa, from first attack.	Regular	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 100 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
3. C. K. m	24	Bookkeeper	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Regular	No	No	No	No	Right iliac fossa, over outer	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
4. J. H. m	41	Stock-raiser	Chronic recurrent, 20 attacks		Dec. 10, 1894	Dr. A. J. McCosh	Recovered	Moderate	Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa, over outer	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
5. W. H. m	32	Mailer	Chronic recurrent, several attacks	Complication of salivary fistula, 15 times to professional visits	Dec. 19, 1894	Dr. J. McCosh	Recovered	Moderate	Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
6. J. P. m	22		Chronic recurrent, 25 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
7. A. D. f	23	School-girl	Acute, 1st attack	Chronic pneumonia					Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
8. J. D. m	23	Packer	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
9. J. D. m	23	Carpenter	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
10. A. R. f	28	Teacher	Chronic relapsing						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
11. E. Mc. f	20	Laborer	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
12. L. F. m	28	[illegible]	Chronic recurrent, 20 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
13. R. I. B. m	42	Lodgekeeper	Chronic relapsing, 26 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
14. J. C. m	21	Laborer	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
15. Mc. A. m	19	Miscellaneous	Chronic recurrent, 25 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
16. J. W. m	21	Farmer	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
17. F. M. f	18	[illegible]	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
18. H. S. m	22	Carpenter	Chronic recurrent, 28 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
19. M. P. f	18	Nursemaid	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
20. M. F. f	18	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
21. M. F. f	18	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
22. M. F. f	18	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
23. M. F. f	18	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
24. W. F. f	18	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
25. G. B. f	19	Clerk	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
26. M. D. f	19	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
27. A. B. f	19	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
28. M. M. f	19	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
29. L. C. f	19	Schoolgirl.	Chronic recurrent, 30 attacks		Dec. 8, 1894	Dr. A. J. McCosh	Recovered	Moderate	Eight days from first attack.	Regular	No	No	No	No	Abdom. right iliac fossa, from first attack.	Right iliac fossa.	18		Temp. 103 F., pulse, 108, Resp. 24. Pain, tenderness, rigidity.	Negative	Acute peritonitis		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.									
30. C. C. f	28	Actress	Acute, 10 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 100 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
31. K. H. m	24	Bookkeeper	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
32. J. D. m	23	Packer	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
33. D. J. m	23	Carpenter	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
34. J. C. m	10	Schoolboy	Acute, 1st attack	Chronic pneumonia					Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
35. H. C. m	15	Errand-boy	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
36. A. W. f	18	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
37. A. B. m	18	Errand-boy	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
38. J. F. f	18	Cook	Chronic recurrent, 20 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
39. W. H. m	19	Salesman	Chronic relapsing, 28 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
40. A. K. m	19 (?)		Chronic relapsing, 26 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
41. M. H. f	19		Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
42. J. L. f	23	School-girl	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
43. J. D. f	17		Chronic relapsing, several attacks	Salivary fistula					Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
44. J. L. m	25	Tailor	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
45. A. W. f	19	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
46. M. B. m	19	Housework	Chronic recurrent, several attacks	Pyorrhœa, right ovarian tumor					Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
47. J. F. f	20	Cook	Chronic recurrent, 20 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
48. M. H. m	19	Salesman	Chronic relapsing, 26 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
49. L. C. f	19	Schoolgirl.	Chronic recurrent, 30 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
50. C. C. f	28	Actress	Acute, 10 attacks						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 100 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
51. K. H. m	24	Bookkeeper	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
52. J. D. m	23	Packer	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
53. D. J. m	23	Carpenter	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
54. J. C. m	10	Schoolboy	Acute, 1st attack	Chronic pneumonia					Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
55. H. C. m	15	Errand-boy	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
56. A. B. m	18	Errand-boy	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
57. A. W. f	18	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
58. M. C. f	19	Housework	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
59. M. M. f	18	Servant	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
60. J. C. m	10	Schoolboy	Acute, 1st attack	Chronic pneumonia					Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
61. E. W. m	19	Errand-boy	Acute, 1st attack						Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						
62. C. L. f	19	Plumber	Chronic relapsing, 15th attack	General review performed on Oct. 18, 1896	Oct. 18, 1896	Dr. A. J. McCosh	Recovered	Moderate	Abdom. pain, right iliac fossa, from first attack.	Constipated	No	No	No	No	Right iliac fossa.	Right iliac fossa.	18		Temp. 101 F., pulse, 84, Resp. 18. Pain, tenderness, rigidity.	Negative	Pain		2 days	Clendenin	Oblique, over outer	Adherent and universal peritonitis.	Appendix not seen; abscess of pelvis.	Considerable	Yes.	No.	Yes.						

Case No.	Initials.	Age.	Occupation.	Type of disease.	mperature, degrees Fahrenheit, pulse, and history.	Urine.	General condition of patient on admission.	Time after beginning of symptoms till admission.	Notes.
58	C. N., male.	26	Butler	Chronic recurrent, fourth attack.	perature, 101; pulse,	Negative..	Excellent ...	5 days.	
59	Dr. B., male.	..	M.D.	Chronic recurrent, second attack.	perature, 98.4; pulse,	.....	Excellent ...	3 weeks.	
60	F. R., male.	26	Student ..	Acute, first attack.	perature, 98.4; pulse, ; not above this at y time.	Negative..	Excellent ...	6 days.	
61	L. K., male.	21	Waiter ...	Chronic relapsing, second attack.	perature, 100; pulse. and immediately opped and remained wn.	.....	Excellent ...	A few days.	
62	C. S., female	24	Student .	Acute, first attack.	perature, 100 (was gher); pulse, 94. th gradually subed.	3 per cent. albumin and casts	Excellent ...	2 weeks.	
63	J. R., male.	17	Printer ...	Acute, first attack.	nperature, 100.5; lse, 85. Both quickly ling.	Negative..	Excellent ...	1 week.	
64	M. S., female	26	Servant ..	Acute, first attack.	perature, 99.2; pulse, Fell quickly.	....	Slight prostration.	2 days	Did not consent to operation.
65	H. K., male.	7	School-boy	Acute, first attack.	nperature, 102.2; lse, 158; respiration, Went up to temrature. 105; pulse,), before death.	Albumin and casts	Moribund...	4 days	General septic peritonitis probably due to appendicitis; patient too weak to be even moved.
66	L. H., female	25	... .	Acute, first attack.	nperature, 102.2; lse, 138. Went up temperature, 106.4; lse, 188; respiration, before death.	Albumin and casts	Moribund...	11 days	Diagnosis based on history of pain in right iliac fossa, otherwise simply the signs of general septic peritonitis.

TABLE NO. II.—THE NINE CASES NOT RECEIVING OPERATION.

Case No.	Initials.	Age.	Occupation.	Type of disease.	Complications.	Date of admission.	Result.	Pain.	Location and history.	Condition of bowels.	Chill.	Nausea.	Vomiting.	Bladder symptoms.	Presence of tumor and location.	Tenderness and location.	Muscular rigidity.	Tympanites.	Temperature, degrees Fahrenheit, pulse, and history.	Urine.	General condition of patient on admission.	Time after beginning of symptoms till admission.	Notes.
58	C. N., male.	26	Butler	Chronic recurrent, fourth attack.		May 29, 1895.	Cured	Moderate.	General	Constipated.	No	Yes	Yes	No.	None felt	General, not markedly localized.	No	No	Temperature, 101; pulse, 88.	Negative.	Excellent	5 days.	
59	Dr. B., male.		M.D.	Chronic recurrent, second attack.		Sept. 16, 1895.	Cured	Moderate.	Right iliac fossa.	Constipated.	No	First attack, not this one.	First attack, not this one.	No	None felt	Slight, right iliac fossa.	No	No	Temperature, 98.4; pulse, 95.		Excellent	3 weeks.	
60	F. R., male.	26	Student	Acute, first attack.		Oct. 26, 1895.	Cured	Slight	Right iliac fossa, a little more than general.	Constipated.	No	No	No.	No	None felt	Slight, right iliac fossa.	No	No	Temperature, 98.4; pulse, 86; not above this at any time.	Negative.	Excellent	6 days.	
61	L. K., male.	21	Waiter	Chronic relapsing, second attack.		Dec. 27, 1895.	Cured	Slight	Right iliac fossa.	Constipated.	No	No	No	No	None felt	Slight, right iliac fossa.	No	No	Temperature, 100; pulse, 80, and immediately dropped and remained down.		Excellent	A few days.	
62	C. S., female	24	Student	Acute, first attack.		Apr. 4, 1896.	Cured	Moderate.	Both iliac fossæ, then right iliac fossa.	Constipated.	No	No	No	No	None felt	Slight, right iliac fossa.	No	No	Temperature, 100 (was higher); pulse, 94. Both gradually subsided.	3 per cent. albumin and casts	Excellent	2 weeks.	
63	J. R., male.	17	Printer	Acute, first attack.		Apr. 19, 1896.	Cured	Moderate.	Right iliac fossa.	Constipated.	No	Yes	Several times.	No	None felt	Slight, right iliac fossa.	No	No	Temperature, 100.5; pulse, 85. Both quickly falling.	Negative.	Excellent	1 week.	
64	M. S., female	26	Servant	Acute, first attack.		June 13, 1896.	Cured	Moderate.	Right iliac fossa, then also epigastrium.	Constipated.	No	Yes	Several times	No	None felt	Slight, right iliac fossa.	A little	Slight	Temperature, 99.2; pulse, 90. Fell quickly.		Slight prostration.	2 days	Did not consent to operation.
65	H. K., male.	7	School-boy	Acute, first attack.	General septic peritonitis.	Feb. 27, 1896.	Died	Severe	General from start.	Constipated.	No	Yes	Yes	No	Too much distention to make out.	General	Marked	Marked	Temperature, 102.2; pulse, 158; respiration, 44. Went up to temperature, 105; pulse, 180, before death.	Albumin and casts	Moribund.	4 days	General septic peritonitis probably due to appendicitis; patient too weak to be even moved.
66	L. H., female	25		Acute, first attack.	General septic peritonitis.	May 27, 1896.	Died	Severe	Right iliac fossa, then general.	Constipated.	No	Yes	Yes	No	Distention interfered, none made out.	Both sides	Moderate.	Marked	Temperature, 102.2; pulse, 138. Went up to temperature, 106.4; pulse, 168; respiration, 46, before death.	Albumin and casts	Moribund.	11 days	Diagnosis based on history of pain in right iliac fossa, otherwise simply the signs of general septic peritonitis.

described has been perfectly satisfactory, and I can see no necessity for the more elaborate, and probably less successful, procedures.

The intermuscular method of McBurney was employed in only seven cases. In a number of others it might have been advantageously used. It seems to me a most admirable procedure in cases where one does not expect to find collections of pus outside the appendix, or dense and extensive adhesions. If the opening should prove insufficient, it can easily be enlarged by dividing the internal oblique muscle, as in the ordinary operation (Case 50).

Case 55 is of interest on account of the insidious onset of symptoms in a case which in other respects might be termed fulminating. The general septic peritonitis at the time of operation was so far advanced that certainly twenty-four hours must have elapsed since its commencement, and yet the patient had not taken to her bed until the previous evening. In the treatment of this case, and of Cases 54, 55, 57, sulphate of magnesia was injected into the small intestine, a procedure which I consider of the greatest value in general septic peritonitis. In this, as in several other patients where this method has been successfully employed, I believe that the result would have been fatal had dependence been placed alone on thorough irrigation and drainage.

Case 31 is of interest on account of the enormous appendix which, plastered by lymph to the posterior surface of the ascending colon, had reached almost to the liver. Its length was eight inches. The patient had suffered for years from pain in the right loin, for which a nephrorrhaphy had been done without benefit.

In Case 57, at the time of operation, there existed well-marked general septic peritonitis. With one exception the symptoms did not indicate the gravity of the case. The temperature and pulse were but slightly elevated (temp., 100½° F.; pulse, 100), and there had been no vomiting, and but little distention, and yet the general appearance of the countenance was such as lead us to suspect the existence of a general peritonitis. The one significant symptom was the rigidity of the abdominal muscles, which was extreme. This condition of the muscles, though not so intense, also existed in Case 55, in which likewise there was a general septic peritonitis.

During the two years from December 1, 1894, to December 1, 1896, there were admitted to Dr. McCosh's service at the Presbyterian Hospital 66 cases of appendicitis. Of these there were suffering from:

Acute appendicitis, first attack	32
Chronic recurrent appendicitis	20
Chronic relapsing appendicitis	14
	66

Of these 66 cases there were:

Operated upon	57
Not operated upon[1]	9
	66

Of the 57 cases that were operated upon there were:

Suffering from appendicitis, but without general septic peritonitis at time of admission to hospital	46
Suffering from appendicitis with general septic peritonitis which had developed before admission to hospital	11
	57

Of the 46 cases operated upon that had not developed general septic peritonitis before admission to the hospital there were:

Recoveries	45
Death[2]	1
	46

an operative mortality in non-septic cases of a little over 2 per cent.

Of the 11 cases suffering from appendicitis with general septic peritonitis which had developed prior to admission to the hospital there were:

Operated upon	9
Not operated upon	2
	11

[1] Of these 9 cases, 7 did not require operation [1 being a subacute case, 6 being acute cases without systemic symptoms on admission that were either plainly subsiding or that had almost subsided, and where a later operation in the interim if necessary, was considered safer] and 2 were cases of general septic peritonitis, moribund on admission and unable to stand the shock either of a general anæsthetic or of the necessary manipulations under local anæsthesia.

[2] One case of general septic peritonitis developing after operation.

Of the 9 cases of appendicitis with general septic peritonitis that were operated upon there were:

Died	6
Recovered	3
	9

an operative mortality in cases of general septic peritonitis from appendicitis of only 66⅔ per cent.

Sex, Age, and Occupation.—Of the 66 cases there were:

Males	36
Females	30
	66

or 6 males to 5 females.

The youngest patient was 5 years of age.
The oldest patient was 50 years of age.

Under 20 years	20	patients.
20 to 30 "	28	"
30 " 40 "	10	"
40 " 50 "	8	"
	66	"

In regard to occupation there were:

Of sedentary occupation (school-teachers, students, clerks)	21
Of laborious occupation (laborers, printers, servants, etc.)	31
Of no given occupation [1]	14
	66

Complications.—As complicating conditions there were:

(*a*) General septic peritonitis	12 cases
(*b*) Pyosalpinx	5 "
(*c*) Obstruction due to constriction of splenic flexure of colon by intestinal band	1 case
(*a*) Subphrenic abscess	1 "
(*e*) Pregnancy	1 "
(*f*) Parenchymatous nephritis due to previous operation on right kidney—cholecystitis, biliary calculi	1 "
	21 cases

[1] The majority of these were "housewives" and should probably be classed more properly under those of laborious occupation.

(*a*) *General Septic Peritonitis.*—Notwithstanding the fact that this complication is supposed to be almost invariably a fatal one, out of 9 cases that had developed this condition prior to admission to the hospital, and were operated upon, 3 have been saved. A very thorough flushing out of the peritoneal cavity by means of hot aseptic normal solution after the removal of the appendix has been the method employed. After the free pus or purulent serum has been drained off as much as possible by turning the patient over on the right side, the edges of the incision in the abdominal wall are grasped by the assistant, held well up, and separated to their full extent; the operator then floods the abdominal cavity from above with the solution from a flask held in his right hand, while with the left introduced among the intestinal coils he moves them gently from side to side, allowing the solution to have full access to every recess and fold. The hot solution is then made to still further flush out the hepatic and splenic corners above, and the pelvic pouch below, by means of the Chamberlain tube introduced into these angles above and below, the irrigation being kept up until the return fluid is perfectly clear. If the patient's condition then warrants it (and it often does, for practically the hot irrigation acts more as a distinct stimulant than otherwise), the flooding by means of the hot solution poured from the flask is repeated, several gallons in all being used. In cases of only slight distention, where it is thought that the intestines can be easily returned, they are allowed to escape, being protected by hot towels, and are then thoroughly washed. If the distention is such that their replacement in the abdominal cavity would be difficult, any considerable escape is prevented by gauze-pads, the salt solution having free access, however, to every intestinal coil. The greater part of the salt solution which remains behind in the abdominal cavity after these procedures have been thoroughly and minutely carried out is then allowed to escape. A considerable amount is, however, left in, both as a means of stimulating the heart and to favor intestinal drainage. Strips of "iodoform" or "sterilized" gauze are then inserted in various directions among the intestinal coils as drains, one strip always leading down to the appendix-stump, or seat of trouble, the ends of all the strips coming out through the abdominal incision, the edges of which are brought just near enough together by silk-worm-gut sutures to prevent the sudden protrusion of intestinal loops during the efforts at vomiting which follow the anæsthetic. On the

thoroughness and skill with which these procedures are carried out in each case will depend the result to a certain extent.[1]

(*b*) *Pyosalpinx.*—This was found in 5 cases as a complicating condition, the tumor being on one or on both sides. (Cases 2, 23, 29, 38, 41.) When the affected tube was on the right side, the appendix was found adherent to the mass below, the inflammatory zones from each source having presumably met and amalgamated the appendix and pus-tube into one mass. In each of the 5 cases examination of the appendix showed that it was responsible, in part at least, both for the local condition found and for the systemic symptoms shown—cases where the peritoneal coat of the appendix only was seemingly involved by spread of the peritonitis from the pelvic organs below not being included in our list of "appendicitis." These 5 cases with complicating pyosalpinx all recovered.

(*c*) *Obstruction Due to Constriction of the Splenic Flexure of the Colon by an Intestinal Band.*—One case (5), a patient who had suffered from several previous attacks of appendicitis. There were alternating attacks of constipation and diarrhœa, and the progress of the fecal matter down the large intestine seemed to be often attended with much abdominal distress and rectal tenesmus, for which a slight hemorrhoidal condition at the anus did not seem to be entirely responsible. One intestinal band stretched directly across the splenic flexure, causing a moderate amount of constriction with some angulation; another stretched across the ascending colon; they were severed by the operator. The patient made an uninterrupted recovery, and while under observation was free from the abdominal pain and attacks of rectal tenesmus. The appendix was found in the right iliac fossa and was the seat of chronic inflammation.

(*d*) *Subphrenic Abscess.*—The case (34) was one of chronic recurrent appendicitis in her second attack. She had been sick (see table) one week, and presented a large abscess in the right iliac fossa; a second abscess had formed apparently posteriorly and

[1] Doubt is sometimes expressed as to the correctness of the diagnosis of "general septic peritonitis" in those cases which recover after operation. When, upon entering the general peritoneal cavity, pus or purulent serum wells out that is not shut in by adhesions, when the intestines throughout are injected and distended, and when masses of lymph are seen scattered over their peritoneal surfaces, the diagnosis of "general septic peritonitis" certainly seems to be a proper one, especially if the systemic symptoms of the patient correspond to the conditions found. The conditions above enumerated existed in Cases 54, 55, 57, which have been described as suffering from general septic peritonitis and which recovered after operation.

higher up, not directly connected with the one in the right iliac fossa. In the first operation the appendix abscess was opened and thoroughly drained, the appendix not being removed however, as it could neither be seen nor felt, and it was not deemed wise to open the peritoneal cavity to search for it. In spite of the thorough drainage of the evacuated pus-cavity the patient's pulse and temperature kept up. Frequent examination of the abdomen and chest did not reveal the source of trouble until forty-six days after the first operation, when signs of a subphrenic abscess were made out posteriorly on the right side. This was opened up in the interval between the ninth and tenth ribs about midway between the posterior-axillary and mid-dorsal lines. The cavity extended downward for some depth; it was washed out and drained with rubber drainage-tubes through this incision and through a counteropening made below at what seemed to be the lowest part of the abscess-cavity; while the patient was under ether the remaining portion of the appendix, which had been giving her some trouble, was removed through the abdominal scar of the first operation, the wound dressed and the abscess mentioned above then evacuated, the patient being turned on her left side for this purpose. The convalescence was uninterrupted but slow. She left the hospital in excellent condition, three months after admission, both wounds being healed.

(*c*) *Pregnancy* (*at sixth month*).—One case (22). The condition was easily recognized before operation, the history being a straightforward one in that respect, and the fundus on a level with the umbilicus. This patient was suffering from chronic recurrent appendicitis, and was operated upon during her second attack. The appendix symptoms were moderate in character, and the diagnosis seemed a fairly clear one. Of special interest is the fact that a mass felt under ether, between the pregnant uterus and the anterior superior spine of the ileum about the region of McBurney's point, turned out to be the large fimbriated extremity of the right Fallopian tube. The operation was on the sixth day of the attack. A large gangrenous appendix was found bathed in pus, which the peritoneum had so far made little or no attempt to shut in. It is probable that here the gradually rising uterus had torn away adhesions formed between it and the appendix in the previous attack, and thus set free the septic matter in or about the appendix. The pus was completely evacuated, and the appendix removed. The stump and area of suppura-

tion were thoroughly drained by iodoform-gauze. The patient made an excellent recovery, her temperature not rising above 100.2° F. at any time after the operation. This patient did not abort.[1]

From the data collected so far it is certain that both mother and child are in imminent danger, and the advisability of immediate operation at whatever period of utero-gestation seems to be generally conceded. It would also appear that the outlook for the fœtus is distinctly better in the cases submitted to operation whether its period of viability be reached or not. If the attack occurs before the period of viability the uterus seems less liable to expel its contents following operation, and the probability of the fœtus being retained till full term is greater. If the attack occurs after the period of viability the uterus seems more disposed to empty itself even without operation, and if the mother be already septic from her appendix lesion the feeble vitality of the child may not be able to resist. In these cases the child has only lived a few days. This factor of the viability of the child certainly seems one well worthy of consideration. In view of the small number of children that have gone on to term in patients who had suffered from a previous attack at any time during their pregnancy, and in view of the high mortality of the children born after the period of viability has been reached in those cases, it would seem that even if we do not take into consideration the great risk run by these mothers themselves, we should strongly advise operative procedure in any case of appendicitis complicating pregnancy, not excepting the mild cases even, for who can say that they can draw a clear line between the cases of catarrhal and of suppurative appendicitis here. How great the dangers may be in a suppurative case are well shown in the case described in this paper.

(*f*) *Parenchymatous Nephritis Due to Previous Operation on Right Kidney. Cholecystitis. Biliary Calculi.*

For the details of these complicating conditions, see Case 31 under "Notes on Individual Cases."

[1] Fowler (Treatise on Appendicitis, 1894, pp. 64–65) mentions five cases occurring in pregnant women, four of his own observation, one cited by Talamon. They all died. Three aborted before operation; two after it.

Other cases have been reported, making a total of 16 up to the present time. Of these 11 were suppurative cases, with 7 deaths. Of the children born during the attack, or shortly after, only 1 has lived as far as known. The last 4 cases reported (by Dr. Abrahams, November, 1896) previous to this one, were cases where the diagnosis seemed fairly plain although not verified by operation.

Consideration of the Symptoms Exhibited.

Pain (*character, history, and location*).—This symptom has varied in severity from mild to severe, none of the cases, however, even when no opiates had been administered, exhibiting pain to the extent of suggesting an acute attack of biliary or renal colic (except Case 31). Still, the possibility of some trouble with the gall-bladder or gall-ducts has been kept in mind, especially in those cases where the pain has been referred high up on the right side. In one case (44), the origin of an abscess situated high up in the right hypochondriac and lumbar regions seemed open to doubt before the operation, and the incision was accordingly made so as to give access to this region above should the focus be found in that neighborhood.

As to the location of the pain, it was as follows:

Beginning in and remaining localized to the right iliac fossa	30
Beginning in epigastrium and shifting to the right iliac fossa	4
Beginning in general abdominal pain and later shifting to the right iliac fossa	9
General throughout	8
Beginning in hypogastrium, then becoming general	3
Beginning in hypogastrium, then shifting to right iliac fossa	2
Beginning in hypochondriac, then shifting to right iliac fossa	2
Beginning in umbilical region, then shifting to right iliac fossa[1]	2
Beginning in umbilical region, then shifting to right inguinal	1
Beginning in right inguinal region, then general	2
Beginning in right lumbar region, then right inguinal	1
Confined to whole right side throughout	1
Doubtful	1
	66

No deductions of value can be drawn in these cases from the character or location of the pain as to the *exact* location of the appendix itself. The point of greatest tenderness or the most prominent portion of the tumor, if present, have been in a general way the guides to the incision. When it seemed probable, however, from the low situation of the mass, that it could be evacuated through an incision just above Poupart's ligament without infringing upon the peritoneum in so doing, this procedure was adopted.

[1] Neither of these were left-sided appendicitis.

Condition of the Bowels.—Constipation more or less marked has been the rule. The following table will show this:

Constipation throughout [1]	54
Constipation followed by diarrhœa, not the result of medicine	2
Regular throughout	3
Diarrhœa throughout	3
Doubtful	4
	66

It may be of interest to note that although the constipation is usually attributed to a paresis of the musculature of the gut, in almost all these cases at the time of operation the caput coli was found to be empty to the feel. With the exception of the cases of chronic appendicitis which were operated upon "in the interval," no cathartic was given before operation, the rectum being emptied in many cases, however, just previous to operation by a pint to a quart of fluid as enema.

In the 3 cases exhibiting diarrhœa throughout there was nothing of special note in the symptoms previous to or in the conditions found at time of operation or in the following course of the trouble.

Chill.—The occurrence of one or more chills is recorded in 10 cases in all. In all of these there was suppuration in some form:

Large abscesses	4
Cases of general septic peritonitis	2
Double pyosalpinx and a cheesy slough in appendix	1
Pus in or about the appendix	3
	10

Nausea and Vomiting.—Nausea and vomiting were:

Severe in	6 cases
Moderate in	36 "
Absent in	24 "
	66 "

The vomiting occurred usually once or twice at the beginning of the attack, and was not, as a rule, repeated after that. Some nausea persisted in about half the cases. Of the 6 cases of severe nausea and vomiting, 3 were general septic peritonitis, and 3 had large abscess formations.

[1] Four of these were almost obstipation.

Bladder Symptoms.—In only 3 cases have symptoms referable directly to the bladder been observed—Case 4, ardor urinæ (no urethritis); tip of appendix deep down in pelvis, inflamed.—Case 26, increased frequency, no urethritis; no cause found in the location of the appendix.—Case 28, retention; a deep abscess between caput coli and bladder, deepest part within one inch of the perineum.

SIGNS.

Presence of a Tumor.—Of the 66 cases, 26 presented masses in the right side, felt from the outside either before or during anæsthesia. In 40 no mass could be made out, even under anæsthesia. Of the 26 cases where a mass was felt in the right side, 24 were abscesses, 2 were masses made up of appendix and adhesions, with no pus to be seen macroscopically. The location is recorded as either (*a*) low down, (*b*) in the right iliac fossa, or (*c*) high up. None on the left side. Their size was from that of a "hen's egg" to that of an infant's head (pus, two pints or more).

Tenderness existed in all cases to a more or less marked degree in the right iliac fossa. In one case (5) it was so slight as to lead to a suspicion that the trouble was not in this region; the appendix, however, was found swollen, erect, and, according to the pathologist's report, its mucous membrane was thinned, ulcerated, and presented some fibrous induration. It contained pus and fecal matter.

Muscular Rigidity.—The right rectus and right lateral abdominal muscles were:

Markedly rigid in	7	cases
Moderately rigid in	20	"
Not rigid in	23	"
No record in	16	"
	66	"

Of the seven cases of marked rigidity five presented an altered or thickened or adherent condition of the parietal peritoneum on the right side in the neighborhood of the incision.

Tympanites.—Moderate or marked in the cases of general septic peritonitis (although absent in Case 57). Not noticed to any very marked extent in the others.

Temperature, Pulse, and Condition of Patient.—Of the operative

cases that recovered, those presenting the highest temperature and pulse on admission were Case 16 (male, aged eighteen), with an admission temperature of 104.7° F. (with a pulse of 120), and Case 23 (female, aged thirty-eight), with an admission pulse of 132 (with a temperature of 101.8° F.), although Case 34 (a little girl, aged five) had on admission a pulse of 140 (temperature, 101.5° F.) and Case 29 which developed her appendicitis while in the ward and exhibited a temperature of 104.5° F. and a pulse rate of 140 before operation. All the cases presenting on admission either a higher temperature or a more rapid pulse than the above died.

Upon looking over the cases it may be said that the height of the temperature on admission seems to have offered but slight help in reaching a conclusion concerning the severity of the process.

In doubtful cases the frequency and quality of the pulse when considered together with the appearance of the patient, as to the amount of prostration present, have afforded the best guide to the condition and as to the advisability of immediate operative interference.

Urine.—In the 7 cases of general septic peritonitis that died, in 3 albumin and casts were found in the urine before operation, in 1 albumin before operation, in 1 nothing abnormal before operation, in 2 the urine was not examined before operation (after operation they contained albumin).

Time after Beginning of Symptoms before Operation.—In the acute cases the average time before the patients were brought into the hospital was nine days; the shortest time being twenty-four hours, the longest seven weeks.[1]

In the chronic cases the first attack had occurred at periods of time varying from a few weeks to ten years previous to admission to hospital. The number of cases to which opiates were given before admission to the hospital cannot be recorded with any certainty, as many of the appendicitis cases in the list were patients brought in on the ambulance with little or no history of their medication.

Other signs found were simply those of the complicating conditions mentioned under "Complications."

[1] This patient had had fever, which had subsided entirely with the appearance of a very large mass in the right iliac fossa, which was not specially tender. Considerable doubt would have existed concerning its nature had not the patient given a clear history of appendicitis.

THE OPERATION.

Anæsthetic.

Ether was administered in	47 cases
Chloroform was administered in	8 "
Ether and chloroform were administered in	2 "
	57 "

the choice being determined to a great extent by the condition of the bronchial mucous membrane, the heart, and the kidneys. When, however, the anæsthetic first chosen was not well borne by the patient, the other was administered, and, if more satisfactory, was persevered in ; if not, a return was made to the first one.

Incision.—The usual incision has been the oblique one over the most prominent part of the tumor, when present ; when the mass was situated low down, however, the incision just above and parallel to Poupart's ligament, already mentioned, was resorted to so as not to infringe upon the peritoneum. In cases presenting no mass the incision has usually been an oblique one with its centre corresponding closely to the point of greatest tenderness in the right iliac fossa.

Of the 8 intermuscular operations that were performed, 7 were in cases of chronic relapsing appendicitis, and 1 was in a case of subacute appendicitis. The abdominal incisions made in these 8 cases united by primary intention throughout, leaving a perfect scar.

Condition of Abdominal Wall, Parietal Peritoneum, and Presence of Intestinal Adhesions.—Nothing of unusual interest was brought out by the consideration of the conditions above mentioned in the operative cases, except that in the 7 cases previously mentioned of marked muscular rigidity, 5 had the parietal peritoneum either much altered, thickened, or adherent.

Location of Appendix.—Unusual positions are recorded in Case 27, where it was situated just below the liver, posteriorly and deep down, and in Case 31, where an eight-inch-long appendix ran up back of the cæcum almost to the liver ; a more common situation in Case 4, where from its position it gave rise to the bladder symptoms mentioned, and Case 54, where it was situated posterior to the uterus, the mass being clearly felt by vagina.

Abscess.—Of the 57 cases operated upon, in 26 there was a "localized abscess." In these 26 cases the appendix was:

Removed in[1]	13
Not removed in	13
	26

The rules determining the removal or non-removal of the appendix in any given case have been in a broad and general way as follows:

In a large abscess case, where the appendix has not been more or less clearly seen or felt in the wound after the evacuation of the pus and the cleansing of the abscess cavity, it has been deemed wise not to separate adherent coils of intestine and open up the way for further infection in the hope of finding an appendix which might possibly have already sloughed completely away. It is a fact that most of these cases do well and have no further trouble. Should the appendix be left behind and give trouble afterwards, the patient as a rule stands a much better chance in a later operation, where the danger incident to the opening of the peritoneal cavity is not so great. If the appendix, however, is plainly seen or felt, and the chances of removing it without opening up the general peritoneal cavity or infecting a considerable part of it in so doing seem good, an attempt is usually made to remove what remains of it, provided a clear view of the field of operation can be obtained. Under these conditions we find that after a thorough cleansing of the abscess cavity has been effected by means of sponges wet in 1 to 1,000 bichloride solution, should a small opening be made into the peritoneal cavity (such as may be brought about by the removal of an appendix which constitutes a portion of the abscess-wall itself), this does not seem to be fraught with undue danger, provided the opening thus made is drained by a piece of gauze inserted between the coils of intestine at this point and brought out with the other gauze drainage-strips in the incision.

This is shown by the fact that in the 10 "simple abscess" cases mentioned above where the appendix was removed, the general peritoneal cavity was opened in each case in so doing, and all of them recovered.

[1] Of these, 10 were "simple abscess" cases, 3 were abscess cases with general septic peritonitis on admission.

Condition of Appendix.

Gangrenous (perforated)	17
Inflamed, not gangrenous	14
Constricted (or angulated) and inflamed	10
Degree of inflammation not recorded (appendix not found, sloughed away, etc.)	16
	57

Two cases are recorded of tubercular appendicitis (23 and 41).

Fecal concretions (one or more) in 8 cases.

Pus in lumen of appendix (enough to be clearly seen) in 14 cases.

In one-half of all the tumor cases (in 13 cases) the appendix was not removed.

In all the other cases it was removed.

Removed in	44
Not removed in	13
	57

Treatment of the Stump.—The mesoappendix is tied off when possible with catgut ligatures and the appendix cut away from it. A provisional catgut ligature is then placed around the base of the appendix about one-quarter to three-eighths of an inch from its cæcal origin, and the surrounding intestinal coils protected from the appendix by sterilized gauze-pads. The appendix is now severed just beyond the ligature by scissors, which are immediately resterilized. This severance of the appendix is facilitated by pinching up a small fold of the peritoneal coat of the appendix between the blades of a pair of forceps which hold the appendix-stump up and away from the surrounding parts. The divided surface of the stump and its lumen are now immediately cauterized with a fine point Paquelin cautery, and a second catgut ligature is applied to the stump similar to the first and next to it to reinforce it, for fear that the first one may have become damaged by the heat of the Paquelin point while in the lumen of the stump. The rest of the wound is then treated according to the other conditions found at the time of operation.

Catgut ligatures and cautery in	23
Silk ligatures and cautery in	12
Catgut ligature only (pus cases drained)	2
Silk ligature only (pus cases drained)	2
Cautery to stump, then reflection of serous cuff and catgut sutures.	1
Packing inserted to region of stump (sloughed)	17
	57

Drainage of the Wound.—Every case of appendicitis where there has not been pus outside the appendix-lumen, or where there have not been extensive adhesions necessitating much separation of opposed intestinal coils, has been drained or not according to the individual conditions in each case. For this purpose in these cases a small strip of iodoform-gauze has usually been found sufficient. At its exit from the peritoneal cavity, and during its transit through the abdominal part of the wound, it has often been surrounded by a small cuff of sterilized rubber tissue. This facilitates its removal when it becomes necessary, for it prevents the tissues in the abdominal incision from adhering to the gauze, and pain and bleeding are thereby obviated.

In pus cases, after the evacuation of the pus, the cleansing of the cavity with sponges moistened with 1 to 1,000 bichloride (and the removal of the appendix if the case is a favorable one for that procedure), the abscess is drained from the bottom up by strips of iodoform-gauze introduced to the depths of the cavity and brought out through the abdominal incision.

In the intermuscular operation where there has been no pus outside the appendix, and the adhesions separated have not been too numerous, and due care has been observed in the technique of the various procedures attendant upon the removal of the appendix itself, the sterile stump is dropped back into the general peritoneal cavity and the various layers of the abdominal wall in the wound are brought together separately by means of catgut buried sutures ; the skin edges are united by means of silk sutures and the wound closed without further drainage. Should, however, the subcutaneous fat in the incision be excessive in amount, a small piece of rubber tissue folded several times upon itself and about one inch long by one-eighth inch wide is inserted between two skin sutures down to this fatty layer, serving as an efficient drain for twenty-four to thirty-six hours, when it is no longer necessary and is removed.

No drainage employed in	13 cases
Drainage employed in	44 "
	57 "

Out of Bed and Departure from Hospital.—The patients are "allowed up" as soon as the condition of the scar tissue warrants it. A patient upon whom the intermuscular operation has been per-

formed, and who has done well, is allowed up usually with perfect safety in ten to fourteen days. Those operated upon by the ordinary oblique incision, where the wound has required little or no drainage, remain in bed for about three weeks. The abscess cases are not allowed out of bed until the scar is firmly united or has healed to a small granulating spot. When they have regained their strength all patients are allowed to leave.

Out of bed in 2 weeks (10th to 14th day)	3
" " " " 3 " (14th " 21st ")	15
" " " " 4 " (21st " 28th ")	16
" " " " 5 " (28th " 35th ")	7
" " " " 6 " (35th " 42d ")	3
" " " " 7 " (42d " 49th ")	1
" " " " 10 "	1
Still in wards	2
No record in	1
	49

The Resulting Scar was so weak as to necessitate:

Secondary suturing of wound (before leaving hospital) in	2 cases
Hernia operation (before leaving hospital) in	1 case
	3 cases

These 3 cases were cases of appendicitis with large abscess formation and required an unusually large wound for free drainage.

Fecal Fistulæ developed in Cases 12, 15, and 31, but closed shortly and have not since reopened as far as known.

NOTES ON THE INDIVIDUAL CASES.

Case 1.—A rapid abscess formation in a chronic recurrent case. The distention and marked prostration suggested strongly an imminent general peritonitis. There was, however, no vomiting. Following immediate operation and the evacuation of the abscess the pulse and temperature fell to normal and the patient made an excellent recovery.

Case 2.—The probability of a double pyosalpinx with appendicitis being entertained previous to operation, all three foci were reached by a median incision, and both pyosalpinx masses removed with the inflamed appendix. The technique in this operation was perfect, and the peritoneum was not soiled; hence the wound was sewed up without drainage. At the first dressing, one stitch was found to be infected; this delayed the healing by a few days, but did not perceptibly weaken the scar, which was a solid one when the patient left the hospital.

Case 3.—The history of six days' obstipation pointed strongly to considerable intestinal paresis, the patient's condition, however, remaining fair. There were many adhesions and much necrotic omentum in the right iliac fossa, necessitating a large drainage wound. This was the cause of the cæcal protrusion, which was remedied by a secondary suturing of the wound before he left the hospital, the resulting cicatrix which healed by primary intention being a solid one. (The absorption from the large amount of necrotic material about the appendix region that had to be thrown off in the wound discharge kept his temperature up to 101° F., and pulse to 80, in the afternoon for about two weeks following the operation. They then gradually sank to normal as the process was completed.)

Case 4.—In this present attack, his second one, the diarrhœa and prostration were marked symptoms. No determining cause could be found for the diarrhœa other than sepsis. There was a comparatively moderate amount of peritoneal inflammation considering the time since the beginning of the attack (four weeks), during which he had had more or less local and constitutional disturbance.

Case 5.—In this case peritoneal bands, apparently the result of previous appendix trouble, were causing distinct obstructive symptoms, which ceased upon the removal of both appendix and bands. (See remarks under "Complications" on this case.)

Case 6.—This was patient's fourth attack. The rapidly formed abscess felt by vagina before operation and diagnosed as probable pyosalpinx by the physician who had attended her, was found to be appendix abscess only, the normal ovary and tube on that side being seen during the operation. After evacuation of this mass, it could no longer be felt by vagina.

Case 7.—This was a first attack, and a condition of intensely rapid general septic peritonitis from the start, originating in a gangrenous and perforated appendix. The patient presented to a marked degree all the symptoms of general septic peritonitis on her admission to the hospital. Her prostration was pronounced, and she had albumin and casts in her urine. The peritoneal cavity was found full of pus; coils injected and distended; no adhesions had formed to localize the infection. The condition had gone on too far, and in spite of the most thorough flushing of the peritoneal cavity and removal of the appendix, she died three days after operation. (See remarks on general septic peritonitis in "Complications.")

Case 8.—An acute case (first attack), with the formation of a post-cæcal abscess within a week. The appendix had melted away. Thorough drainage with rapid recovery.

Case 9.—Another case of fulminating (twenty-four hours) general septic peritonitis, originating in a gangrenous appendix, in this his first attack. There was no evidence of the formation of any limiting adhesions about the organ. In spite of the operative procedures he died of his sepsis four days later.

Case 10.—A case of chronic relapsing appendicitis (obliterans). She had had several previous attacks of catarrhal endoappendicitis which had completely destroyed the mucous membrane lining. (The appendix was not adherent.) It was completely imperforate—a very favorable case for the intermuscular operation. She was up on the fourteenth day, and went home on the seventeenth with a perfect scar.

Case 11.—An acute case in his first attack. If the history be correct, we have the formation within twenty-four hours of a huge abscess containing over two pints of pus, originating from a large gangrenous appendix. The extensive abdominal incision which was required for the proper drainage of the cavity, necessitated a secondary suturing of the wound. The resulting scar was firm.

Case 12.—An instructive case. The patient, a young minister, had complained of colic beginning five days before, but had kept at his usual work. Twelve hours before admission, his temperature and pulse jumped up to the neighborhood of 101° F. and 80, respectively, and there was a rapid growth of a mass in the right iliac region with systemic symptoms. The operation was done just in time to prevent the spread of a septic peritonitis, the peritoneal cavity containing already free serum ; a gangrenous spot from the appendix had spread to that portion of the cæcum which was adherent to it. This was thought to be the cause of the fecal fistula which was found at the second dressing, but which closed completely in a short while. The abdominal scar left here was a good one, and remains so now, eighteen months after the operation.

Case 13.—This was considered to be a very favorable case for the intermuscular operation, the patient not having had fever above 101 to 102° F. as far as known in his single previous attack, and there being reason to believe that there would be found few or no adhesions. The patient made an excellent recovery, and left the hospital with the usual scar after this operation, a perfect one.

Case 14.—Another case, very much similar to the last, where the conditions were thought to be very favorable for an intermuscular operation. Perfect result.

Case 15.—This patient had had a previous operation for appendical abscess (in another hospital in this city, four years ago), where the abscess was simply drained and the appendix not removed, as it could be neither seen nor felt. The same conditions prevailed at this operation, the parts being so matted together that it was impossible to find "appendix remains" without breaking up more adhesions than was considered justifiable in view of the danger of opening the peritoneal cavity on account of the mass of pus present. A fecal fistula formed later on, which closed, however, before he left the hospital.

Case 16.—An abscess case (first attack), with some septic absorption ; temperature, 104.7° F.; pulse, 120. Did perfectly well after simple drainage.

Case 17.—A case in which the prognosis before operation was good, as symptoms had been mild. A gangrenous appendix was found surrounded by many fresh and old adhesions. The stump was cauterized and the peritoneal cavity drained by means of iodoform-gauze. Notwithstanding this, her temperature, forty-eight hours after operation, rose to 106° F., and her pulse to 152, with symptoms of general septic peritonitis. She died the next day. This is the only death occurring after operation in the total of all the forty-five cases of appendicitis which were not suffering from general septic peritonitis at the time of their admission to the hospital.

Case 18.—Abscess developing after three previous attacks of appendicitis. Drainage and removal of appendix, followed by complete recovery.

Case 19.—Another abscess (post-cæcal) developing after several previous attacks of appendicitis. Removal of appendix and drainage, followed by complete recovery.

Case 20.—An acute first attack, with a large abscess formation in two weeks. The mass was situated so low down that it was thought best to open it just above Poupart's ligament, so as not to impinge upon the peritoneum. Simple drainage, followed by complete recovery.

Case 21.—This patient, who had had several previous attacks, came into the hospital almost moribund, with general septic peritonitis and the abdomen full of purulent serum and scattered collections of pus. Immediate operation and a thorough flushing of the peritoneal cavity (see notes on general septic peritonitis in "Complications") did not avail him; he died sixteen hours after. Bacilli coli communis were found in profusion in the cultures from the free pus in the abdominal cavity. The trouble had started from a gangrenous appendix.

Case 22.—A case with pregnancy as a complicating condition and presenting some unusual points. (See remarks under "Complications.")

Case 23.—An interesting case. The symptoms were evidently due both to the pyosalpinx and to the appendicitis. The inflammation in the appendix proved under the microscope to be tubercular, that in the Fallopian tube non-tubercular. There was a small swollen gland in the mesoappendix.

Case 24.—An acute case (first attack), with the formation within six days of three separate and distinct abscesses in the right iliac fossa, one containing the gangrenous appendix and its fecal concretion. The removal of the appendix and the drainage of all three abscesses was followed by complete recovery.

Case 25.—The house-surgeon. The advisability of an intermuscular operation was considered here, but owing to the probability of adhesions and pus, the ordinary operation was decided upon. The incision through the muscles, however, was only about one inch long, and that through the peritoneum of about the same length, just enough to admit the finger to the appendix region. It was found possible to separate the adhesions about the appendix and bring the organ up for removal through this incision, which was somewhat enlarged. It was particularly desirable to give this patient a strong scar, and the muscular layers were therefore brought into very accurate apposition and sutured separately with buried catgut sutures. No drainage, followed by primary intention and a perfect scar. Complete recovery. This patient played "hard foot-ball" this fall without any weakening of the scar, or any sense of discomfort in this region.

Case 26.—A case of considerable interest, where the symptoms were out of proportion to the local condition found. The pain and tenderness in this case were referred distinctly to the location of the appendix as found at operation. There was also some pain referred to the right ovary as felt by vagina. The pain subsided completely from both these regions upon the removal of the appendix and right ovary. The pathologist could report nothing amiss with either appendix or ovary.

Case 27.—A first attack, with a general septic peritonitis within five days from a sloughing appendix. This patient came into the hospital almost moribund; free pus in the peritoneal cavity; coils injected and distended, and covered with lymph exudate. The same thorough flushing of the peritoneal cavity (see notes on "general septic peritonitis" in "Complications") was carried out, but the patient died four days later. (The appendix here was situated under the posterior edge of the liver.)

Case 28.—An abscess case from an appendix, situated low down, the lowest part of the abscess being deep in the pelvis and within an inch of the perineum, and giving rise to reflex bladder symptoms. Drainage and complete recovery.

Case 29.—This case came in for her pyosalpinx, the appendicitis developing while under observation in the wards. Her temperature and pulse were 104.5° F. and 140 before operation, due undoubtedly to both lesions. The appendix was inflamed, and its zone of inflammation had merged into that of the right pyosalpinx. Excellent recovery.

Case 30.—Another virulent case of general septic peritonitis from a sloughing and perforated appendix. The patient came in on her third day with a pulse of 180, almost moribund. The peritoneal cavity was found full of pus, all coils distended and injected, and lymph flakes throughout. Died eighteen hours later. Unfortunately, the culture-tubes inoculated with the free pus from the peritoneal cavity were too dry and no cultures were obtained.

Case 31.—A case of unusual interest. Patient had been troubled for years with oft-repeated attacks of pain in the right side, diagnosed as "movable kidney" in another hospital in this city, where she had a nephrorrhaphy done in January, 1896. Almost as soon as she was out of bed from this operation, the old trouble returned. She entered this hospital and had her right kidney removed, which was congested and in a condition of parenchymatous inflammation. The pain, however, in the right side persisted, though somewhat altered in character, and the patient developed a temperature of 103° F., and pulse 100 in the afternoon for two days (after they had been down to normal for several days following recovery from the nephrectomy). This led the attending surgeon to believe that the whole trouble had not been removed, and on February 10 her appendix was removed. It was found bound down back of the cæcum, was eight inches in length, and reached almost up to the liver. The gall-bladder was found to be much inflamed and thickened, the common duct considerably indurated. Several calculi were removed from the gall-bladder, one of these as large as a marble. Both wounds were drained, and the patient made a slow, but uninterrupted, recovery. (Fecal fistulæ formed in both wounds, but lasted only for a few days.) Patient left the hospital relieved of her pain, with both wounds healed.

Case 32.—An enormous abscess from an acute appendicitis seven weeks before. Drainage. Tedious, but complete recovery with a fair scar.

Case 33.—A seemingly mild case, his third attack; the appendix, however, a long one, contained a few drops of pus and was adherent at its tip to the posterior part of the bladder. Complete recovery.

Case 34.—A case complicated by the formation of a subphrenic abscess. (See notes on the case in "Complications.")

Case 35.—The youngest patient in this list (five years). She came in on the sixth day of her attack (first attack) with a very large abscess. The abdominal wound had to be a long one, and the resulting scar was a weak one, necessitating a second operation for the hernia.

Case 36.—(The mother of the patient is Case 2 of this list, operated upon for appendicitis fifteen months previously.) This is the daughter's first attack (a mild one), the appendix, however, presenting considerable changes of its

structure. The intermuscular operation was performed, giving her a perfect scar.

Case 37.—An acute case (first attack), in which the mass was formed within two days, consisting entirely of appendix and adherent intestinal coils. Of note here is the fact that the serous and muscular layers of the appendix were necrotic at one spot, the mucous membrane comparatively uninvolved.

Case 38.—Of the chronic relapsing variety. The appendix and both Fallopian tubes were found inflamed. They were removed and the retroverted uterus was ventro-fixated. Uninterrupted recovery.

Case 39.—A first attack, with abscess formation in three days from a sloughing appendix. Drainage and complete recovery.

Case 40.—An abscess case of seven days' formation, where the appendix had apparently sloughed away. Drainage and complete recovery.

Case 41.—A chronic case. The appendix, tubes, ovaries, uterus, rectum, and bladder were all united into one adherent mass. The appendix presented a cheesy tubercular slough at its base. Complete recovery. It seems hard to say here just where the primary tubercular lesion was. (Compare Case 23 of this list.) There were also tubercular-looking spots on the cæcum.

Case 42.—A chronic case, with a large abscess (O. ss.), nine days old, very deeply situated in the right iliac fossa. Owing to the depth of the cavity, some pus pocketed, necessitating a counteropening later. This delayed the healing somewhat, but the patient left the hospital in excellent condition, with both wounds healed.

Case 43.—Nine attacks in one year. Operation done in the interval. The appendix was behind the caput coli, and considering the number of attacks, the amount of disease found was moderate. There were, however, several points of constriction in its mucous membrane, and the submucous coat was thickened and congested; certainly a dangerous appendix for the patient to carry. The intermuscular operation was followed by complete recovery and a perfect scar.

Case 44.—His third attack, a large abscess developing within seven days in the right iliac fossa and extending laterally into the ilio-costal region. The appendix had sloughed. Drainage and complete recovery.

Case 45.—A chronic relapsing case, with one previous attack; was considered a favorable case for an intermuscular operation. The appendix was cicatricial, angulated by adhesions about its middle, stenosed, and contained a drop or so of pus. Prompt recovery and perfect scar. (An appendix "well out.")

Case 46.—Another abscess, formed in an acute first attack of five days' duration. The abscess was situated at the tip of the appendix. Drainage, with removal of the appendix, followed by complete recovery.

Case 47.—A general septic peritonitis from an acute first attack, beginning fourteen days previous to admission. There were multiple abscesses scattered throughout the peritoneal cavity. Coils deeply injected and distended. The operation improved his condition, but he died in four days.

Case 48.—(See Case 60.) This patient was in the hospital April 9, 1896, for a subacute appendicitis not requiring operation then. Three months later he developed in two days a small abscess at the tip of his appendix. It was evacuated and the appendix removed. Complete recovery.

Case 49.—A "timely operation" here. The gangrenous area in the appendix was on the point of breaking down and liberating about two drachms of pus which was contained in the lumen of the organ. No adhesions to be seen.

Case 50.—A chronic recurrent case in his third attack. On account of the mild character of the two previous attacks (fever had been very slight and local manifestations inconsiderable) it was considered a fair case for an intermuscular operation, which was accordingly started. The adhesions, however, proved too strong and numerous to be broken down through the small opening, and accordingly the intermuscular operation was converted into an ordinary one by a division of the fibres of the internal oblique and transverse muscles in the same line as that of the external oblique. The appendix was the seat of chronic inflammation and was removed. The abdominal muscles were carefully sutured, layer by layer, and the patient left the hospital with an excellent scar. This patient gave a history of a distinct traumatism over the region of his appendix as the starting-point in each of his two previous attacks. It seems quite probable that such trauma may have disturbed previously existing adhesions, or started up previously existing disease in the appendix.

Case 51.—A chronic relapsing case operated upon between attacks. Intermuscular operation with a perfect scar. The appendix was the seat of chronic inflammation, and completely stenosed in three places, a dangerous organ. The cæcum in this case had shared in the same sort of inflammation as the appendix. It was very considerably thickened (three times, at least, the normal), presumably as the result of a chronic entero-colitis. No signs of ulceration were seen.

Case 52.—An acute first attack twelve days previously, with abscess formation from a sloughing appendix. Removal and drainage, with prompt recovery.

Case 53.—The history of a first attack, with moderate constitutional symptoms. The appendix, however, presented evidences of previous trouble, and was in a condition of chronic inflammation. Removal and recovery.

Case 54.—A case of exceptional interest. The patient, a maid-servant, complained of some abdominal pain on Sunday evening, November 8, 1896, which did not prevent her, however, from packing fourteen trunks the next afternoon; after this, she ate her supper. Within eighteen hours she developed the symptoms of general septic peritonitis, and at the operation, which was done Tuesday afternoon, November 10, the general abdominal cavity was found full of pus, the coils injected and distended, lymph flakes all over intestines. A most thorough flushing out of the peritoneal cavity was carried out (in the manner mentioned in "Complications"), and the source of the trouble, a large gangrenous appendix, removed. The prognosis was, of course, a very bad one, but ten days after the operation her temperature had subsided to 99.2° F., pulse to 96, and respiration to 22. She had not vomited once. Her bowels had moved on the second day by simple enema, and regularly without medicine ever since. The only treatment that she received was the stimulating one of whiskey and normal salt solution enemata every six hours, and strychnine by hypodermic for the first forty-eight hours. She partook of clam-broth on the third day with relish, and has since made an uninterrupted recovery. The discharge from the wound has been a free one. The patient is still in the wards. The behavior of this case, and of the next one (54), is certainly instructive, and contains the

strongest sort of an argument for a thorough operation, if possible, in these cases, no matter how advanced the trouble may be, the essential point being the thoroughness with which the peritoneal part of the technique is carried out after the removal of the appendix. The diagnosis of this case before operation seemed to be general septic peritonitis from pyosalpingitis, the mass felt by vagina in Douglas's cul-de-sac being interpreted as the right tube. It was found to be the mass about the gangrenous and perforated appendix in an unusually low situation, adhesions binding it down into the pelvis.

Case 55.—Another general septic peritonitis case saved by means of this same thorough flushing of the peritoneal cavity. The infection had spread in twenty-four hours from a large inflamed appendix to the serous coverings of all the organs in the abdominal cavity; free pus everywhere; coils of intestine injected, distended, and covered with flakes of newly formed lymph. On the third day after operation his temperature had fallen almost to normal, and he has since gone on uninterruptedly toward recovery. The patient is still in the hospital at this writing. This patient received an intra-intestinal dose of one ounce of magnesium sulphate, administered with two fluidounces of water with a large syringe and needle, a Lembert suture being taken over the opening made by the needle in the gut-wall.

Case 56.—Of the chronic relapsing variety, with four previous attacks. Operation done in the interval by the intermuscular route. (The appendix was completely stenosed in two places and contained a fecal concretion and some pus between the stenosed points. There were very few adhesions, and these only to the caput coli—a dangerous appendix for the patient.) Primary union of the wound with a perfect scar. Patient is now up and about.

Case 57.—A case of general septic peritonitis from appendicitis (chronic relapsing), and presenting some unusual features. He gave on admission the history of having had fourteen similar previous attacks with intense general abdominal pain and marked constipation. His abdomen was flat and intensely rigid. Pulse, 100; temperature, 100.2° F. Both the history and general condition seemed to point toward lead-colic (the patient being a plumber), except that he lacked the "blue line" along the margin of the teeth. It was decided, however, to operate, and a condition was found of general septic peritonitis throughout, originating in an intensely inflamed appendix. The peritoneal cavity was found full of free pus of thin consistency, and all the intestines covered with a fibrinous exudate. After the removal of the appendix an excessively careful washing out of the peritoneal cavity was carried out (see under septic peritonitis in "Complications"), and one ounce of magnesium sulphate in solution injected into the small intestine by a syringe with large needle, the opening in the intestinal wall made by the needle being sewed up by two Lembert sutures. Free drainage was secured by iodoform-gauze strips. Directly after the operation ten grains of calomel were given by mouth with good effect, and patient made an excellent recovery, leaving the hospital six weeks after the operation with the wound healed.

Cases 58, 59, 60, 61, 62, 63.—These cases were all either subacute in character, without any general systemic infection visible, or were acute cases without any mass formation whatever, which came into the hospital during the very last days of their subsiding attack; where the proper treatment seemed to

be rest for the present and a later operation if necessary. One of these (60) had another attack in three months and recovered after operation.

Case 64.—Operation was advised to this patient on account of the prostration which, though mild, indicated a possibility of serious trouble in or about the appendix. The patient's consent, however, was not obtained, and no operation was performed.

Cases 65, 66.—Both cases of general septic peritonitis, occurring in chronic recurrent cases where the patients practically came into the hospital only to die. In neither of these two cases, on account of the shock, would it have been possible either to administer a general anæsthetic or to carry out the necessary measures under local anæsthesia. A stimulating treatment was the only one that could be given to them.

XIII.

CEREBRO-SPINAL MENINGITIS, FOLLOWED BY HYDROCEPHALUS—AUTOPSY.*

By W. P. Northrup, M.D.

A THREE-YEAR-OLD boy entered the Presbyterian Hospital, New York, with symptoms of cerebro-spinal meningitis. He had already been sick a month. Before this illness he had usually been well and strong.

His personal history was as follows: A month before entrance he was "out of sorts and feverish," the mother said; the next morning he vomited; the same evening he had six epileptiform convulsions; for the next few days neck and back were stiff, and he cried when moved. After a week his symptoms subsided, and for another week the boy seemed improved.

At the beginning of the third week of illness, the stiffness and pain in the neck returned. He had general spasmodic movements of the arms and legs, the light seemed to bother him, so the mother said; he ground his teeth, rolled his head; was stupid, called out, eyes had an unnatural stare; he lay in a stiff sort of way, did not speak, and cried when disturbed.

On examination at the hospital the following notes pertinent to the case were taken: Poorly nourished, and anæmic; dentition good; chest showing slight degree of rickets; practically no fever; tongue moist. He was very irritable; neck rigid, eyes staring, moderate photophobia; knees and thighs flexed while lying in bed; sensitive to pressure along vertebral spines; resistance and pain on motion of legs; free general desquamation. On abdomen and thigh was a mottled, macular eruption, a little dusky in appearance. Abdomen retracted; heart rapid (120); lungs negative; pharynx and tonsils a little ingested; respiration, 19; temperature 98° F.

For the first week in the hospital his condition remained much

* Read before the American Pediatric Society, Montreal, May 26, 1896.

the same. Temperature irregular, the highest being 102.2° F. Spasmodic movements of left hand were mentioned in the history, and occasional vomiting. During the week he gradually developed an abscess of the left side of the neck, with fever. After the abscess was opened, he continued the gradual improvement. Eight weeks after entrance to hospital, and the twelfth week of his illness, when apparently doing very well, he suddenly had a little attack which is difficult to explain. To quote the notes: "At 7 P.M. pulse became weak and intermittent; pupils pinhole; eyes did not move when lids were lifted. This attack passed off in five minutes, head and neck still rigid."

Following this his convalescence became established; he gained flesh, went about the wards, visited the roof promenade, and after six weeks was discharged, cured.

The patient was then sick altogether four months. The diagnosis by the attending physician was epidemic cerebro-spinal meningitis—abscess of the neck—recovery.

One month from the date of his discharge from hospital, and five months from the first appearance of this disease, our young patient, now three and a half years old, re-entered the hospital with what appeared to be a return of the previous symptoms.

During his sojourn at home he had apparently regained his former health, flesh, and strength; but he never became so mentally bright as before his illness.

His history on second entrance was: Three days of vomiting of all food; frequent putting his hands to his head, and crying out as though in pain; no convulsions; pain frontal and temporal; vomiting projectile; no fever.

On readmission this time to my service his condition was much better than on first admission. Well nourished, not anæmic; tongue coated slightly; some erythematous spots on the skin: head apparently larger; eyes were staring, restless; head held rigidly; mental dulness; few subcrepitant râles; heart normal.

His last stay in hospital was one month. In this time he screamed out occasionally, vomited at irregular intervals. He lay in stupor, quiet, with a pale, mask-like countenance. When his head was brought forward on his chest, his countenance showed signs of pain, but it was also observed that if his arm was flexed or extended, or his leg was flexed, in fact, if any of his muscles which had remained

for hours unmoved were put upon a stretch, his countenance evinced pain. Suddenly, without any premonition, the child died.

Autopsy by Dr. Thacher.—Brain, convolutions flattened; ventricles extremely distended four or five times their normal size, contents of ventricles clear serum; ependyma granular, no tuberculosis. Spinal cord, no tuberculosis; central canal not distended.

The post-mortem examination was made with tuberculosis in mind. No tubercles were found in the pia mater; the granular condition of the ependyma was proved non-tuberculous under the microscope; no tubercles were found in the bronchial lymph-nodes; no cervical or mesenteric lymph-nodes were tuberculous, and there was no bone tuberculosis.

To recapitulate: A three-year-old child with negative family and personal history ran a course of epidemic cerebro-spinal meningitis, from which he seemed, after four months, to have recovered. After one month of apparent bodily health his symptoms returned.

If there had been, as so frequently happens, no previous obtainable history, I should have pronounced this second attack somewhat confidently, tuberculous meningitis with dilated ventricles.

The autopsy showed non-tuberculous ependymitis, the ventricles dilated and serum-filled. Here are explained the phenomena of the second illness: Intraventricular pressure, hydrocephalus, dilated and distended ventricles, giving rise to symptoms simulating the late stage of tuberculous meningitis.

As to the former illness, with its evidences of pain, its fever, stiffness of neck, and eruption, that already given would seem a reasonable diagnosis. At autopsy there was no trace of a former meningitis, no thickening of the pia, no adhesions, blood-vessels apparently normal. There was a form of inflammation then, not tuberculous, but having products of inflammation which were absorbable. Our conclusion is that the patient first suffered from cerebro-spinal meningitis, a certain proportion of the lesions of which subsided. The lesion of the ependyma continued, the product of its inflammation being mostly serum. In other words, hydrocephalus was a sequel of cerebro-spinal meningitis. This is in accord with the observations and teachings of Dr. Delafield, and in accord with most classic literature.

This case seemed of interest on account of the rarity of such cases leaving a complete history.

XIV.

TUBERCULAR ADENITIS OF THE AXILLA, FOLLOWING INFECTION OF THE RIGHT INDEX FINGER.

By E. Eliot, Jr., M.D.

E. F.; aged fifty-five; blacksmith; admitted March 13, 1896.

A sister died of phthisis. Moderate alcoholic habit. No specific history. About twenty years ago patient suffered from night-sweats, cough, and some hemoptysis. He has been free from all these symptoms but the cough for some years.

Three months ago, patient had an infected wound of the right index finger. It was cured by incision. Shortly after a "boil" appeared at the site of the former trouble; this was also incised. About one week after an abscess formed in the right axilla; this was opened about eight weeks ago, and the resulting sinus has persisted up to the present time. During this interval he has lost twenty pounds in weight and considerable strength.

Examination. There is found in the right axilla a hard lobular mass, adherent to the surrounding parts, which is very painful. Near the lower border of the pectoralis major, is the opening of an unhealthy sinus, discharging serous pus. A probe introduced passes into the adherent mass above mentioned, a distance of three inches, toward the apex of the axilla. Active movement of the shoulder impossible. Passive movement very much restricted and very painful.

Patient has had during this time symptons of moderate sepsis, which have prevented him from working, although they have not confined him to bed.

March 14. *Operation.* Ether. Through an incision along the lower border of the pectoralis major, five inches in length, the entire contents of the axilla were removed *en masse.* The brachial plexus, the axillary vessels, the subscapular and posterior thoracic

nerves were exposed, but not damaged. The diseased skin was removed. A counter-opening was made, posteriorly, above the lower border of the latissimus dorsi, and two rubber drains were inserted. The extremities of the wound were closed with silk ; the wound itself was packed with iodoform gauze and dressing applied. Patient reacted well from the effects of the operation.

Four weeks after the operation the parts were entirely healed. Function has been completely restored to the shoulder-joint again, and the patient is able to work as a blacksmith, having gained both weight and strength.

Examination by Dr. J. S. Thacher of the axillary mass removed at the time of operation, showed a broken-down condition of the glands, matted together by inflammatory changes, the mass itself containing several distinct abscesses, which did not communicate with the sinus externally, and which therefore had no means of drainage.

The microscope demonstrated the existence of a large number of tubercle bacilli.

The interest in the case centres in this fact, that the axillary glands inflamed, as a result of the septic process in the finger, had become secondarily infected with the tubercle bacillus, the original focus of tubercular trouble probably being in the lung.

XV.

A CASE OF GANGRENE OF THE RETROPERITONEAL FAT.

By E. Eliot, Jr., M.D.

The retroperitoneal space is bounded in front by the posterior layer of the peritoneum, belonging to the greater cavity, as well as by the posterior wall of the lesser cavity, where it lies behind the greater sac. It is continuous, in front, with the properitoneal space, and from it prolongations extend to different viscera, as, for example, the intestine, such spaces being lined on both sides with the peritoneum, forming the mesentery of the organ, between which the blood-vessels, nerves, and lymphatics, which nourish and supply that organ, are situated. Behind, in the median line, this space is bounded by the vertebral column; laterally, by the transversalis fascia, which is continuous with this same fascia as it lies anterior to the properitoneal space, in front. Above, it extends as high as the diaphragm; below, it descends into the cavity of the pelvis behind the rectum.

It is also lined in part by those structures which are not completely invested by the peritoneum; from above downward, in front, lie the posterior surface of the liver, the posterior surface of the second part of the duodenum, the posterior and lateral aspects of the third part of the duodenum, the posterior surface of the pancreas, the median portions behind of the ascending and the descending colons (except, in the very young, when these structures usually have a mesentery), and, in the pelvis, the posterior portion of the second part, and the entire third portion of the rectum.

This space is entirely filled with a mass of adipose tissue, and in this tissue, completely invested by it, lie the kidneys. At this point, the fat is probably more abundant than at any other part of the space. In this mass of adipose tissue are also embedded various lymphatic glands, the ducts of which empty into the thoracic duct.

The following case was treated at the Presbyterian Hospital in March, 1896.

Kate H., aged twenty-six ; married ; housewife ; family history negative ; has had four children, the last one year ago, which the patient has nursed up to the present time. The first menstrual period, after the birth of the last child, occurred ten days ago, and lasted three days ; it was accompanied with more pain than usual. Patient gives an indefinite history of several attacks of abdominal pain in the past ; she cannot definitely state the location of the pain or the duration of these attacks. They were mild in character, and were not so severe as the present illness.

She was entirely well until three days ago ; she was then seized with severe abdominal pain, rather general in character, but at times more severely felt in the epigastrium, just above the umbilicus, and on the right side. Vomiting has been almost constant, and she has retained little nourishment. Bowels not constipated, and this morning, following saline catharsis, patient had a free movement. During this time she has suffered continually with fever, and at times has had chilly sensations, but no distinct chill.

On admission, temperature, 101° F. ; pulse, 140 ; respiration, 20. Patient well nourished, not anæmic ; skin is moist ; there is an anxious expression ; apparently considerable dyspnœa. Thorax normal. Abdomen is considerably distended, especially in the lower part. On palpation there is general tenderness, more marked above the umbilicus, and also at a point just above and to the inner side of the anterior spine of the ileum, corresponding to the position of the appendix. The entire abdomen is rigid, this rigidity being more marked below than above, and on the right side it is more marked than on the left, although the difference is very slight. The abdomen is generally tympanitic, although this note is less distinct in the region of the appendix, and in the vicinity of the umbilicus. Vaginal examination gives a negative result.

Operation was advised, and performed under ether. Incision on the right side, as in the ordinary appendix operation. When the peritoneum was opened there escaped a considerable amount of clear, serous fluid, which was situated in the general peritoneal cavity. The colon presented in the wound, and was very much distended ; its color and serous coat, as well as that of the intestine, normal. Small intestine not distended. The appendix was found

springing from the junction of the cæcum and the ileum, but passing immediately upward, was situated principally behind that organ. It was joined to the posterior surface of the cæcum by moderately firm adhesions, extending upward to the tip. The color of the appendix was normal pink, and contrasted very distinctly with the greenish color of the fat in the retroperitoneal space on either side of it. In the process of separation no hemorrhage took place from this fatty tissue. At the same time no pus was seen during the entire operation, either from this point or from any other in the abdominal cavity. The appendix was ligated with catgut, and removed in the usual way. An examination of the pelvic organs found them in a normal condition. The incision was extended upward, and the gall-bladder was exposed. This was normal in structure, but in a distended condition. The finger was passed through the foramen of Winslow, and a firm, rounded mass was felt, corresponding to the position of the pancreas. This was, however, larger than the normal pancreas. There were a few adhesions blocking the foramen, which easily gave way to the pressure of the finger. Scattered through the omentum, which contained a large amount of fat, were numerous small granular bodies of the size of millet seeds, of firm consistency and whitish in color. Several of these were removed with a small piece of omentum, for further examination, and some of the fluid from the cavity of the peritoneum was placed in a tube containing a solution of gelatin, for bacterial investigation. The wound itself was left open, and iodoform-gauze packed around a long clamp that had been left *in situ*, grasping the band of adhesions that had been attached to the apex of the appendix, high up in the retroperitoneal tissue. The upper part of the wound was sutured with silk-worm-gut, and the ordinary antiseptic dressing of sterilized gauze applied. Patient stood the operation very well.

There was no immediate change in the condition of the patient after the operation. The temperature still continued high, the pulse 120 to 140, and the vomiting persisted for thirty-six hours; at that time, however, the patient's temperature had diminished to 100° F., and the pulse to from 100 to 110; the vomiting had yielded to lavage, and her general condition had become very much better. The pain had also diminished. From this time on the temperature gradually rose to 105° F., and did not return to 100° F.

until the tenth day. During this interval her pulse ranged from 125 to 150, but on the morning of the tenth day had decreased to 100 again ; at intervals the vomiting recurred, but yielded readily to lavage, as on the day immediately after the operation, so that it did not interfere with her nutrition to any extent. As to the condition of the wound at this time, it may be said that the abdominal distention disappeared, but that there was considerable tendency to the protrusion of the ascending colon. At the beginning the wound assumed a sloughy appearance, but at the end of the tenth day had become covered with healthy granulations, although the protrusion still persisted.

The general condition of the patient had been comfortable, and she had complained of nothing until the fourth day after the operation, when swelling and pain first appeared in the left parotid gland which did not yield to cold application, but gradually went on to suppuration, and was opened ; this caused the patient a great deal of discomfort. After twenty-three days the patient died, her pulse rising suddenly from 120 to 170 twenty-four hours before her death, and her temperature shooting up from 103° to almost 106° F. Forty-eight hours before her death both temperature and pulse had reached 100, and her general condition looked like one on the road to recovery after a severe illness. There never at any time after the operation had been any distention of the abdomen, and for the past week before her death the wound had contracted and looked as if it were in the act of healing.

I add the pathologist's (Dr. J. S. Thacher) report of structures removed at time of operation, and a brief extract of the autopsy. Appendix : mucous membrane appears ulcerated. Omentum : yellow, cheesy spots, one-fourth millimetre in diameter ; on microscopic examination these spots are found to be areas of necrosis of adipose tissue ; on microscopic examination the structure of the appendix mucous membrane is irregular ; there are slight signs of inflammation in the outer coats. Culture from the abdominal cavity at the time of operation shows abundant bacilli, resembling colon bacilli ; there are also large cocci, probably from the air.

Autopsy.—The lower left lobe, inferior portion, and part of the upper are collapsed. The serous coats of the loops of intestine present a healthy appearance ; they are matted together in places by retroperitoneal collections of pus, situated between the two layers of

the mesentery, and in the retroperitoneal tissue on either side. The ascending colon is entirely shut off from the general peritoneal cavity, and lies in a bed of greenish, sloughy tissue behind, which is continuous above with the fat surrounding the pancreas. Pancreas is normal in appearance, firm, and is surrounded by a mass of necrotic tissue, some of it looking like necrosed fat. There are small spots of necrosis scattered about in the omentum and mesentery; on microscopic examination the pancreas is seen to be the seat of an increase in its connective-tissue framework, but there are no signs of previous hemorrhage, nor are there any suppurative foci.

The interest of this case centres in the question of diagnosis before the operation in what was found at the time of operation, and in the general course of the disease after the operation. In the first place, on the admission of the patient to the hospital, she was believed to be suffering from a suppurative process in the abdominal cavity, whether originally pelvic in character or appendical was a matter of doubt; the absence of any intrapelvic tumor, on examination per vaginam, together with the presence of greater muscular rigidity on the right side and an indistinct history of previous attacks, all pointed to a peritonitis of an appendical origin. Whether from appendix or tube, the symptoms indicated a general peritonitis, and an operation was advised merely to give her the only chance of recovery.

When the abdominal cavity was opened it was seen that there was no peritonitis. The appendix showed old signs of previous trouble, as the adhesions binding it to the cæcum were not of recent formation. The necrotic condition of the retroperitoneal tissue behind the colon was seen, and the dilated condition of the colon pointed to some interference with the nervous mechanism of that structure. The presence of such a large amount of serum in the peritoneal cavity was rather an evidence of some obstruction in the abdominal circulation.

The course of the disease resembled in many respects typhoid fever, although the marked irregularity of the temperature suggested its septic character; there were no chills at any time during the disease, and the only metastatic abscess outside the abdominal cavity took place in the left parotid gland. The presence of large numbers of bacilli in the fluid which was evacuated from the peritoneal cavity were indicative of the severity of the lesion, and in all probability

the removal of this fluid by operation prolonged the life of the patient. The only fresh adhesions found at the time of operation were in the vicinity of the foramen of Winslow, and indicated the location of the original focus—namely, in the fat surrounding the pancreas. The persistent vomiting, as well as the continual diarrhœa, can readily be ascribed to the excretion of the products of infection by the wall of the alimentary canal.

The autopsy simply furnished evidence that would exclude the pancreas from being the seat of the primary trouble; even with such a process in the immediate vicinity of that organ, it remained free from contamination, and did not show any acute change in its structure. As to the exact nature of this condition, it is very difficult to say from what source the infection originally came. As a matter of conjecture, an embolic process would be the most probable, though why this should interfere with the vitality of the retroperitoneal tissue, without affecting the vitality of the gut, is very difficult to see. If of an embolic nature, it is not, strictly speaking, a primary, but a secondary condition, the source of which it is impossible to ascertain, as well as the vessel in which the embolus originally lodged.

Although obscure, the lesion is certainly interesting, and one worthy of further investigation.

XVI.

A CONTRIBUTION TO THE STUDY OF COLD BATHING IN TYPHOID FEVER.

By J. P. Thornley, M.D.

Since July, 1890, the date of the first tub-bath in this hospital, the Brand method of tub-bathing in typhoid fever has been a recognized means here, for controlling the temperature, stimulating the circulation, and increasing the depth and vigor of the respirations. Since that time a large number of tub-baths, sponge baths, and a few cold packs have been given to the typhoid patients.

The result is shown by the table at the end of this article, which is compiled from an analysis of two hundred cases taken in the regular order of death or discharge from January 17, 1893, to December 31, 1895.

That the result differs slightly from that of other hospitals can be explained by the fact that some of the patients received no baths, such as we are now speaking of; some only late in the disease when other methods had failed, many were not treated by tub-baths alone, a number received only sponges, and a few were hopeless from the day of admission.

These should be, in justice, excluded from the final estimation of averages and percentage. Such a selection of cases would, however, lay one open to the charge of unfairness, and it has, therefore, been thought best to give the figures as they stand.

In the description of a method one naturally begins with various appliances necessary.

The Tub.—The tub is a long, narrow, deep one, sloping at one end like a bath-tub. It is mounted on metal wheels lined with rubber, in order that it may be moved easily and noiselessly about the ward. At the foot of the tub is a large valve, for filling and emptying it by means of a hose. A few feet from the head, on

either side, are handles, to which a cloth stretched across the tub is attached. This is for the patient's shoulders.

The Water is, of course, ordinary hydrant water, and the temperature is 75° F., as a rule, but may vary as stated below.

The Bed.—While the patient is in the bath the bed is re-made, and over this first placed two large rubber blankets and then a sheet, or ordinary blanket.

The Bath.—The tub, filled with water, is brought close up to the patient's bedside and the screens are drawn. A binder is now placed around the hips and pinned, cotton placed in each ear, and he is lifted by his feet and shoulders, into the tub. While in the tub he is gently but energetically rubbed over his arms, legs, chest, and *back*, while his face and head are kept wet with a sponge wrung out in ice-water.

The bath over he is lifted into bed, covered with a dry sheet and blanket, given a glass of hot milk, or whiskey and water, to drink, and a hot-water bottle to his feet. Here he is left for an hour, when his temperature is again taken, and the rubber sheets removed.

The Sponge Bath.—The sponge-bath is also used to a considerable extent.

The rubber sheets are placed under the patient in the same order as after the tub-bath, and a rolled blanket may be placed under these on either side to prevent overflow, thus giving the patient a semi-tub bath.

The water is of the same temperature as that used in the tub, and the patient is sponged from head to foot. From time to time the water is allowed to fall from the height of one or two feet upon his chest. This procedure is kept up from ten to fifteen minutes, when the remaining water is soaked up with the sponge, the patient dried off, the rubber sheets rolled from under him, and he is covered with a sheet and blanket, given a hot drink, and a hot-water bottle to his feet. His temperature is taken one hour later.

Rules Usually Observed.—With the exceptions given below all typhoid fever patients are bathed whose temperature reaches 102.5° F. or over at the fourth hourly observations. The temperature of the water for the first bath is, as a rule, 75° F., and this temperature in succeeding baths may be lowered to 60° F., according to the nature of the case.

The duration of the bath is fifteen minutes, but it is sometimes found that better results are obtained, with a bath of low temperature and shorter duration, than with one of higher temperature and longer duration. The exceptions are: hemorrhage when the baths are discontinued until the stools are free from blood; perforation, of course, renders their discontinuance imperative. Patients suffering from collapse, or weak and debilitated from other causes, usually women and old people, and occasionally one who strenuously objects, are not bathed.

The choice of the sponge-bath in place of the tub-bath is largely one of convenience. With the sponge the same amount of friction to the surface is not given. This detracts from the stimulating effect of the bath as well as from the comfort of the patient. With the sponge, the fall of temperature, pulse, and respiration is not as marked as after the tub, and in making out the following table it was remarked that these remained stationary, or went up more frequently after the sponges than after the tubs.

In conclusion, I wish to express to the attending staff my thanks for many kindnesses, and for permission to publish this article and the following tables.

TABLE OF CASES OF COLD-WATER BATHING IN TYPHOID FEVER

Volume.	Page.	Number of Case.	Week of Admission.	Tubs, Number of.	Sponges, Number of.	Time in Hospital (weeks).	On Admission.			Highest.			Lowest.			Complications.	Duration.	Result.
							Tem.	Pulse.	Resp.	Tem.	Pulse.	Resp.	Tem.	Pulse.	Resp.			
40	189	1	1st.	16	0	8	102.5	106	28	105.0	110	33	98.0	65	18	None	5	Cured.
40	3	2	1st.	0	4	3	103.5	135	36	105.0	135	36	97.8	80	20	None	3	"
41	281	3	1st.	0	0	7	101.8	116	32	104.4	140	38	97.0	80	20	Chronic endocarditis	6	"
42	14	4	1st.	0	0	8	102.8	84	20	103.8	100	24	97.0	72	18	None	5	"
43	85	5	1st.	39	0	6	103.8	100	24	105.0	116	24	96.8	66	16	None	5	"
43	120	6	1st.	4	0	4	103 2	84	20	104.6	108	28	97.5	64	16	None	4	"
43	230	7	1st.	7	2	5	101.4	104	36	105.0	112	40	97.0	60	20	None	4	"
44	28	8	1st.	0	0	4	102.6	110	32	103.6	112	34	96.6	72	20	None	3	"
44	43	9	1st.	22	0	6	103.6	96	30	104.6	136	36	97.0	75	18	None	5	"
44	45	10	1st.	47	0	6	102.0	72	28	105 0	120	30	97.0	62	18	None	5	"
45	42	11	1st.	40	3	6	104.0	108	30	105.0	120	36	96.5	76	20	Gonorrhœa	5	"
	77	12	1st.	9	2	8	102.2	120	30	104.6	120	30	98.0	72	18	None	4	"
46	1	13	1st.	102	0	10	101.8	100	28	106.5	156	48	98.0	96	20	Malaria (plasmodia found)	8	"
46	4	14	1st.	36	0	10	104.0	126	32	105.5	160	38	97.0	68	18	Acute cardiac dilatation	6	"
46	28	15	1st.	69	0	9	105.6	132	36	105.6	144	40	98.0	72	18	Recrudescence	8	"
	69	16	1st.	8	0	3	102.8	80	20	104.8	84	36	97.2	56	16	None	5	"
	77	17	1st.	44	1	7	104.0	120	40	104 5	128	44	98.0	68	19	None	6	"
	102	18	1st.	22	0	5	104.8	120	30	105.5	136	48	97.2	70	20	None	4	"
	195	19	1st.	42	0	2	103.0	97	37	105.0	143	60	99.5	98	26	Perforation	3	Died.
47	180	20	1st.	0	12	6	102.4	99	29	103 8	120	36	97.5	72	18	None	7	Cured.
	39	21	1st.	0	8	6	103.5	80	20	104.8	80	24	98.0	52	16	None	7	"
49	54	22	1st.	0	0	5	103.0	100	16	103 2	100	36	98.0	60	16	None	5	"
54	123	23	1st.	0	6	6	99.5	100	30	105.4	108	36	97.5	56	16	None	5	"
	200	24	1st.	0	8	1	102.8	96	28	105.5	112	40	100.0	88	22	Hemorrhage; cirrhosis of liver	2	Died.
56	147	25	1st.	15	7	7	103.0	92	36	104.0	100	42	97.0	68	16	None	4	Cured.
	220	26	1st.	22	0	6	103.0	112	32	104 4	116	32	98.0	64	18	None	3	"
	252	27	1st.	27	49	3	105.6	100	26	106.0	128	48	99.0	72	20	Broncho-pneumonia	4	Died.
57	266	28	1st.	0	0	9	103.5	100	26	104.0	112	28	97.0	60	20	None	4	Cured.
58	54	29	1st.	10	12	8	105.0	104	28	105.0	125	32	97.0	68	18	None	6	"
	214	30	1st.	0	50	10	104.0	116	24	105.2	116	34	97.2	72	16	None	5	"
59	188	31	1st.	58	54	16	102.0	100	22	105.0	142	40	98.5	88	18	Hemorrhage	10	"
64	90	32	1st.	15	15	9	102.0	120	38	105.2	160	44	96.8	76	18	None	7	"
	161	33	1st.	0	0	3	102.0	112	24	103.2	112	28	98.0	60	16	None	4	"
66	72	34	1st.	54	10	6	104.2	128	32	105.2	128	32	98.2	70	18	None	5	"
67	297	35	1st.	0	0	2	101.2	100	28	103.0	100	32	98.0	66	18	None	4	"
69	67	36	1st.	38	0	6	104.4	112	36	104.8	128	32	97.5	80	18	None	6	"
	235	37	1st.	39	0	6	103.2	94	24	105.0	126	36	98.0	89	18	Hemorrhage; ischio-rectal abscess	5	"
70	66	38	1st.	32	0	6	102.0	90	24	104.2	104	28	98.0	76	20	None	5	"

NOTE.—Mortality, 7.8 per cent. Complications and relapse, 23.6 per cent. Average duration, 5.1 weeks.
NOTE.—Duration estimated to ten days after first subnormal temperature.

TABLE OF CASES OF COLD-WATER BATHING IN TYPHOID FEVER—*Continued.*

Volume.	Page.	Number of Case.	Week of Admission.	Tubs, Number of.	Sponges, Number of.	Time in Hospital (weeks).	On Admission.			Highest.			Lowest.			Complications.	Duration.	Result.
							Tem.	Pulse.	Resp.	Tem.	Pulse.	Resp.	Tem.	Pulse.	Resp.			
40	191	39	2d.	28	0	9	103.6	96	24	105.5	130	30	97.5	68	18	Phlebitis	7	Cured.
43	16	40	2d.	0	6	1	102.8	120	40	104.2	140	60	96.0	84	30	Arterial thrombosis	3	Died.
	28	41	2d.	5	0	4	102.5	88	30	104.0	96	30	97.0	57	18	None	4	Cured.
44	70	42	2d.	15	0	5	102.8	106	28	105.0	120	32	97.8	65	18	None	5	"
	72	43	2d.	19	4	3	105.4	104	36	105.6	120	36	97.0	72	20	Hemorrhage	4	"
	74	44	2d.	5	0	3	101.6	96	26	104.2	96	26	96.0	60	20	None	4	"
	92	45	2d.	27	3	7	102.8	88	24	105.0	118	36	97.2	72	20	Belladonnæ poisoning	6	"
45	10	46	2d.	23	22	5	103.8	104	24	105.0	114	30	98.0	70	18	Hemorrhage	6	"
	44	47	2d.	7	0	5	103.4	102	26	103.0	104	32	98.0	68	17	None	4	"
	47	48	2d.	42	0	6	105.2	102	36	105.5	120	39	98.0	60	18	None	7	"
	67	49	2d.	7	0	2	103.5	92	28	104.0	136	36	98.2	92	20	None	5	"
	89	50	2d.	78	0	8	102.2	106	24	105.8	138	36	97.0	68	18	Relapse	7	"
	160	51	2d.	0	0	1 day.	99.8	128	40	105.4	160	60	98.8	120	40	Hemorrhage; cirrhosis of liver	2	Died.
	167	52	2d.	11	0	4 days.	104.4	92	28	106.4	156	30	100.0	92	18	Hemorrhage	3	"
	209	53	2d.	0	15	4 day .	104.8	108	32	105.4	146	48	102.0	100	30	None	3	"
46	12	54	2d.	1	0	3	102.2	84	24	103.6	100	32	97.0	60	18	None	5	"
46	12	55	2d.	1	0	3	102.2	84	24	103.6	100	32	97.0	60	18	None	5	Cured.
	53	56	2d.	0	0	2 days.	102.5	100	29	104.5	148	48	100.0	100	29	Broncho-pneumonia	3	Died.
	61	57	2d.	17	0	7	103.2	112	20	104.0	116	36	97.5	78	20	Ulcer of rectum	7	Cured.
	65	58	2d.	12	0	7	103.5	98	32	104.2	104	36	97.0	72	20	None	8	"
	67	59	2d.	14	0	4	103.4	124	24	104.2	124	26	97.0	50	16	None	4	"
	71	60	2d.	3	0	6	103.2	100	24	103.2	116	24	97.5	60	18	None	8	"
	95	61	2d.	12	0	4	101.0	92	20	104.6	116	28	97.5	68	20	Aneurism	5	"
	117	62	2d.	0	6	6	104.2	108	22	104.2	116	36	97.2	74	20	None	4	"
	118	63	2d.	0	3	7	100.8	108	28	102.0	108	28	98.0	80	20	None	4	"
	122	64	2d.	51	0	2	104.5	112	32	105.5	192	40	100.8	96	16	Hemorrhage	4	Died.
	143	65	2d.	0	6	4	104.8	136	36	104.8	136	36	97.0	100	24	None	5	Cured.
	144	65	2d.	22	0	7	104.6	116	20	104.8	116	28	98.0	72	18	None	6	"
	152	67	2d.	50	1	7	104.0	102	26	105.0	140	36	98.0	80	20	None	7	"
	170	68	2d.	25	7	1	105.2	124	44	105.8	160	52	100.5	110	26	Lobar pneumonia	3	Died.
	175	69	2d.	90	0	6	104.8	100	26	105.2	136	36	97.8	68	17	Recrudescence	8	Cured.
47	157	70	2d.	21	0	5	102.8	118	38	104.4	124	38	98.0	76	18	None	5	"
	240	71	2d.	24	14	4	103.2	120	26	105.6	137	39	97.8	76	17	None	6	"
	258	72	2d.	39	11	11	103.5	84	28	106.0	120	30	97.4	72	16	Hemorrhage	7	"
48	196	73	2d.	40	0	6	104.5	106	24	105.2	132	40	98.5	72	18	Pleurisy with effusion	8	"
50	56	74	2d.	43	0	8	100.6	102	28	105.5	120	32	97.6	66	16	Recrudescence; hemorrhage	8	"
	69	75	2d.	81	1	16	103.0	102	28	105.2	148	60	98.0	80	20	Pneumonia; pleurisy with effusion	11	"
	152	76	2d.	0	3	16	105.8	121	40	106.0	132	40	97.0	72	22	Pneumonia; malaria; abscesses	6	"
52	91	77	2d.	4	0	8	101.6	94	24	104.4	100	28	97.6	68	18	None	10	"
	187	78	2d.	2	3	1	105.0	108	34	106.0	158	54	100.8	92	28	Broncho-pneumonia	3	Died.
54	295	79	2d.	2	0	3	100.8	100	22	103.8	100	28	98.0	60	16	None	4	Cured.

55	18	80	2d.	0	80	10	104.8	112	28	106.2	126	38	98.0	76	16	Hemorrhage	16	Cured.
	46	81	2d.	46	0	8	102.5	96	32	104.6	112	36	97.5	64	20	Ischio-rectal abscess	6	"
	138	82	2d.	1	8	3	102.4	98	26	104.0	108	28	98.0	50	18	None	5	"
	141	83	2d.	15	0	1	103.6	108	24	105.0	120	40	100.0	80	22	Taken from hospital		
	162	84	2d.	28	8	5	102.5	108	32	104.6	120	36	97.8	78	18	None	5	"
	173	85	2d.	19	66	10	103.8	80	20	105.8	104	32	98.0	70	16	Recrudescence	12	"
	230	86	2d.	130	0	7	104.8	92	28	105.8	124	32	97.5	64	12	Recrudescence	10	"
	280	87	2d.	29	5	7	105.0	104	24	105.0	112	32	98.0	68	16	None	7	"
56	84	88	2d.	15	17	1	103.0	108	32	106.8	148	60	99.6	98	18	Lobar pneumonia	3	Died.
56	276	89	2d.	47	6	9	104.0	88	28	105.8	120	32	97.0	64	16	Recrudescence	8	Cured.
	89	90	2d.	13	23	1	102.8	116	28	105.2	142	36	101.0	108	19	None	3	Died.
	116	91	2d.	0	0	4	103.0	100	26	103.0	100	26	98.6	60	18	None	5	Cured.
	161	92	2d.	0	34	14	103.2	104	24	104.4	152	30	98.2	84	20	Phlebitis	6	"
	258	93	2d.	22	0	8	103.8	104	30	104.0	110	36	97.0	58	16	None	4	"
	267	94	2d.	53	5	10	101.0	96	28	105.6	120	32	97.8	72	16	None	8	"
57	43	95	2d.	40	5	8	102.0	92	24	105.5	132	28	97.6	72	13	None	6	"
	74	96	2d.	2	3	3	103.8	112	20	104.0	116	28	97.0	68	18	None	5	"
	106	97	2d.	0	5	7	104.5	100	20	106.6	120	30	95.0	60	18	None	4	"
	197	98	2d.	124	5	12	104.8	100	23	105.2	120	30	97.2	76	14	None	9	"
58	24	99	2d.	16	43	7	103.8	100	24	105.5	100	28	97.0	60	16	None	7	"
	28	100	2d.	10	41	9	105.5	124	40	105.8	126	40	97.0	80	16	None	8	"
	73	101	2d.	32	22	9	104.0	108	30	105.0	136	32	97.5	72	16	None	5	"
	86	102	2d.	0	31	1	104.8	96	32	106.8	138	36	100.5	88	20	Hemorrhage	8	Died.
	137	103	2d.	9	30	10	104.2	88	28	104.2	120	30	97.6	70	20	None	8	Cured.
59	23	104	2d.	0	32	7	100.0	100	32	105.0	128	40	97.0	74	18	None	9	"
	225	105	2d.	0	45	8	102.5	96	16	104.4	122	42	98.0	84	14	None	6	"
	274	106	2d.	0	27	9	105.0	108	32	105.0	112	36	97.5	60	14	None	5	"
	376	107	2d.	0	29	9	104.6	104	24	105.8	126	30	98.0	68	18	Relapse	9	"
61	185	108	2d.	4	30	15	104.2	108	30	105.2	160	40	97.2	80	18	Cellulitis; broncho-pneumonia	8	"
62	168	109	2d.	0	3	5	101.5	106	40	105.0	138	40	98.0	80	20	None	5	"
64	182	110	2d.	0	0	3	102.8	100	26	103.4	100	26	98.0	70	18	None	4	"
	237	111	2d.	0	0	3	101.0	110	32	102.5	110	36	98.0	60	18	None	5	"
65	88	112	2d.	68	8	8	102.8	100	22	105.2	110	28	98.5	72	20	None	9	"
	138	113	2d.	0	0	5	104.0	90	24	104.0	94	30	97.2	60	18	None	5	"
	252	114	2d.	0	53	5	104.0	100	28	105.5	124	50	97.8	68	17	Relapse; hemorrhage	7	"
66	28	115	2d.	52	42	8	104.8	96	22	105.2	106	28	97.4	56	16	Relapse	8	"
	146	116	2d.	0	0	4	102.4	108	26	102.4	108	26	98.4	58	18	None	4	"
	149	117	2d.	0	4	3	103.8	88	24	103.8	90	24	98.2	60	18	None	5	"
	203	118	2d.	0	2	2	103.2	84	30	103.4	84	30	97.8	54	18	None	5	"
67	93	119	2d.	23	18	2	104.4	112	28	104.8	160	60	99.6	108	20	Broncho-pneumonia; purulent pharyngitis	4	Died.
	144	120	2d.	18	0	6	100.6	96	28	104.5	104	28	98.0	70	18	None	5	Cured.
	192	121	2d.	15	0	4	104.5	116	21	104.5	120	30	96.6	66	20	None	5	"
	250	122	2d.	0	85	8	105.0	112	45	105.0	124	45	97.6	76	20	Recrudescence; chronic endocarditis	8	"
67	260	123	2d.	63	8	7	103.8	98	36	105.2	132	42	98.5	76	18	Relapse; hemorrhage	9	"
	264	124	2d.	62	20	8	102.0	120	28	105.2	120	40	98.0	72	20	Neuritis; boils	6	"
	271	125	2d.	24	4	4	102.8	100	25	105.0	114	25	98.0	70	20	Boils	6	"
	297	126	2d.	30	11	1	102.0	100	28	106.5	156	88	101.8	106	25	Broncho-pneumonia	3	"
68	24	127	2d.	20	0	4	102.5	104	24	104.8	108	28	97.0	56	18	None	5	"
	56	128	2d.	1	0	6	104.0	100	28	105.0	120	32	98.0	72	16	None	5	"
	87	129	2d.	79	7	8	106.0	117	21	106.2	138	30	98.0	74	18	Neuritis; ischio-rectal abscess	6	"
	119	130	2d.	0	0	4	100.5	104	30	102.6	104	32	98.8	70	18	None	6	"
	131	131	2d.	43	31	8	102.5	100	20	104.2	176	60	98.0	76	20	Broncho-pneumonia; phlebitis; abscesses	10	"

TABLE OF CASES OF COLD-WATER BATHING IN TYPHOID FEVER—*Continued.*

Volume.	Page	Number of Case.	Week of Admission.	Tubs, Number of.	Sponges, Number of.	Time in Hospital (weeks).	On Admission.			Highest.			Lowest.			Complications.	Duration.	Result.
							Tem.	Pulse.	Resp.	Tem.	Pulse.	Resp.	Tem.	Pulse.	Resp.			
	186	132	2d.	4	4	4	102.5	108	26	104.8	124	26	98.0	68	17	None	5	Cured.
	196	133	2d.	0	0	3	102.8	84	20	104.8	106	24	97.5	64	18	None	4	"
	258	134	2d.	5	0	7	104.5	110	30	104.5	120	40	98.8	80	20	None	8	"
	295	135	2d.	48	5	6	104.2	94	26	104.8	112	32	98.0	70	16	Relapse	8	"
	302	136	2d.	6	19	1	103.8	80	26	105.8	164	70	101.8	74	22	Cerebral embolism; Phlebitis	3	Died.
	282	137	2d.	45	4	6	103.8	100	28	105.2	108	38	97.4	68	15	Hemorrhage, pulmonary and intestinal	7	Cured.
67	7	138	2d.	6	12	7	101.8	100	42	105.8	129	42	96.8	52	16	Relapse; boils	7	"
	36	139	2d.	28	8	5	104.6	102	28	104.6	112	30	98.0	72	16	Boils	6	"
	52	140	2d.	17	6	8	103.7	100	28	103 8	120	32	97.0	80	18	Recrudescence	8	"
	57	141	2d.	15	22	6	106.0	100	30	106.0	120	36	98.4	72	16	Cellulitis	7	"
	136	142	2d.	17	3	5	104.8	96	24	104.8	104	24	97.0	72	18	None	5	"
	152	143	2d.	11	2	5	104.5	92	24	104.5	100	24	97.5	60	18	None; abscess; gangrene	5	"
	220	144	2d.	66	38	12	105.8	120	32	105.8	126	38	98.5	72	18	Recrudescence; relapse	8	"
	285	145	2d.	22	6	1	104.2	80	24	105.8	152	30	97.4	80	10	Hemorrhage	7	"
70	48	146	2d.	55	0	1	105.0	104	26	106.0	110	34	97.4	74	18	Malaria; phlebitis; neuritis	6	"
	160	147	2d.	0	0	1 day.	106.8	158	24	107.4	170	24	106.8	148	24	None	2	Died.
	243	148	2d.	21	4	1	104.2	116	40	106.0	146	62	100.0	100	28	Broncho-pneumonia; alcoholism	3	"
	282	149	2d.	72	0	10	103.0	108	24	105.0	132	28	97.8	72	10	Boils; relapse; neuritis	8	Cured.
	331	150	2d.	0	27	5	104.0	84	22	105.0	116	28	98.0	68	16	None	7	"

NOTE.—Mortality, 7.4 per cent., excluding 5 cases moribund on admission. Complications and Relapse, 45.5 per cent. Average duration, 5.8 weeks.

43	82	151	3d.	9	14	6 days.	105.2	104	32	107.5	128	40	100.5	80	18	Hemorrhage	4	Died.
45	170	152	3d.	3	0	5	102.0	104	24	105.6	160	32	98.0	72	18	None	6	Cured.
	221	153	3d.	12	0	1	103.8	120	20	104.6	140	40	99.2	96	20	None	4	Died.
46	7	154	3d.	36	0	5	103.2	99	28	104.8	120	28	98.0	78	20	None	7	Cured.
49	78	155	3d.	0	48	4	105.0	96	28	105.5	120	38	98.5	60	20	Hemorrhage; broncho-pneumonia	7	Died.
51	30	156	3d.	3	14	8	102.2	120	24	103.8	124	28	97.0	72	18	Relapse	10	Cured.
	232	157	3d.	17	6	6	104.0	104	28	104.4	112	28	97.5	84	16	Papular eczema	7	"
56	27	158	3d.	19	0	7	103.2	86	24	104.8	100	28	98.0	60	16	None	7	"
	80	159	3d.	3	1	7	103.5	100	24	103.5	118	30	97.8	68	18	None	7	"
	98	160	3d.	53	6	8	105.8	100	30	105.8	120	38	97.8	76	18	None	7	"
	199	161	3d.	6	6	3	104.8	104	32	104.8	106	32	97.8	60	16	None	6	"
57	114	162	3d.	0	10	5	103.2	116	36	104.8	116	36	97.5	60	16	None	6	"
	164	163	3d.	48	5	10	103.0	118	24	105.0	130	28	97.8	64	18	Hemorrhage	7	"
	271	164	3d.	12	1	9	104.0	120	28	105.2	150	30	98.0	80	20	None	7	"
58	57	165	3d.	30	14	9	104.8	96	34	104.8	120	44	98.0	76	20	None	8	"
	69	166	3d.	39	13	6	104.0	112	36	104.8	128	36	97.0	60	18	None	7	"
	81	167	3d.	0	0	6	101.8	100	26	103.0	108	36	96.6	76	20	None	5	"
	283	168	3d.	19	14	5	104.8	126	26	105.6	126	32	98.0	80	18	Hemorrhage	7	"

	287	169	3d.	0	49	12	105.0	104	24	105.0	124	32	98.0	80	18	None	11	Cured.
59	354	170	3d.	0	13	7	102.4	124	28	104.5	136	30	97.0	72	14	Phthisis	7	"
64	45	171	3d.	43	11	5	104.2	86	20	105.0	104	24	98.0	76	18	None	7	"
	101	172	3d.	63	8	4	103.0	108	32	105.8	144	40	100.0	100	28	Hemorrhage	7	Died.
	234	173	3d.	0	1	7	103.8	116	32	104.5	116	26	98.6	72	20	Relapse; sciatica	10	Cured.
	292	174	3d.	0	7	1	105.2	120	28	105.2	138	40	99.8	108	24	Morphine habit	4	Died.
65	169	175	3d.	0	3	5	102.0	100	26	104.0	106	28	97.2	72	18	None	7	Cured.
	257	176	3d.	0	0	3	100.8	92	20	103 0	92	28	97.8	62	16	None	5	"
66	90	177	3d.	16	16	6	103.4	96	20	104.8	140	36	98.0	72	15	Hemorrhage: relapse	7	"
	268	178	3d.	50	0	5	104.2	120	36	105.0	136	36	97.8	80	20	None	7	"
	91	179	3d.	0	1	4	103.0	140	46	103.0	140	40	98.0	74	18	None	6	"
	139	180	3d.	65	0	5	103.6	100	24	105.0	138	40	97.5	78	14	Relapse; perforation	8	Died.
	146	181	3d.	2	1	4	103.4	120	28	103.4	120	28	98.2	84	16	None	6	Cured.
69	3	182	3d.	11	2	7	102.4	96	26	104 0	110	26	97.6	80	16	Malaria; neuritis	8	"
	15	183	3d.	37	3	7	104.0	114	28	106.0	140	32	98.4	76	16	Boils	6	"
	128	184	3d.	0	7	5	103.4	90	30	103.8	104	32	98.0	72	15	Neuritis	7	"
70	23	185	3d.	32	60	5	104.8	124	28	106.4	164	60	99.0	92	20	Broncho-pneumonia	8	Died.
	54	186	3d.	20	12	7	104.6	88	26	105.2	102	28	97.0	70	18	Bronchitis; relapse	6	Cured.
	105	187	3d.	42	8	10	103.0	108	26	104.2	120	28	98.0	72	16	Boils	6	"
	275	188	3d.	0	46	9	104.5	120	26	105.7	144	32	98.0	72	17	Abscess; otitis media	10	"

NOTE.—Mortality, 18.9 per cent. Complications and relapse, 45.9 per cent. Average duration, 7.0 weeks.

54	228	189	4th.	0	0	6	100 2	116	30	102.8	116	30	97.2	60	16	None	8	Cured.
45	139	190	4th.	6	8	6 days.	104.5	124	20	107.2	160	40	100.0	88	20	Hemorrhage	5	Died.
61	314	191	4th.	0	54	2	104.6	80	32	106.2	144	44	101.0	80	15	Hemorrhage	6	"
65	116	192	4th.	0	0	6	101.0	90	20	102.8	130	24	97.5	76	15	None	10	Cured.
	291	193	4th.	41	5	1	103.8	100	32	106.4	118	36	99.2	70	24	Perforation; hemorrhage	5	Died.
66	132	194	4th.	0	1	5	101.4	88	18	103.0	120	30	97.8	60	18	Gastritis	8	Cured.
70	74	195	4th.	67	0	11	105.2	100	24	105.2	128	29	96.7	68	18	Relapse; neuritis; Phlebitis	10	"

NOTE.—Mortality, 42.9 per cent. Complications and relapse, 50 per cent. Average duration, 7.4 weeks.

57	10	196	8th.	6	24	10	102.5	96	24	104.8	108	26	97.5	72	18	Relapse	11	Cured.
45	33	197	5th.	0	2	6	103.0	112	26	103.0	120	32	98.0	72	18	Relapse	7	"
63	337	198	5th.	37	18	8	97.5	92	22	106.0	106	28	98.4	76	18	Recrudescence	7	"
67	54	199	6th.	1	0	4	103.0	116	24	103.4	119	28	98.0	78	18	Cystitis	8	"
70	206	200	6th.	0	20	10	104.5	140	24	104.5	146	44	97.5	80	20	Phlebitis; cystitis	14	"

NOTE.—Mortality, 0 per cent. Complications and relapse, 100 per cent. Average duration, 9.4 weeks.

XVII.

RUPTURE OF THE QUADRICEPS EXTENSOR TENDON — SUTURE.

(THREE OPERATIONS, TWO PATIENTS.)

By Andrew J. McCosh, M.D.

A RUPTURE of the quadriceps extensor tendon is not a very rare accident, neither should its diagnosis be difficult, and yet from a perusal of the reported histories of such cases the impression is received that in many of them the injury was overlooked because the examining physician was not alive to the possibility of such an accident. In these cases it is of the utmost importance that appropriate treatment should be at once begun. What treatment shall be adopted? Shall it be rest in bed with elevation of the limb, etc., or shall it be an operation for suture of the divided tendon? There are certainly many cases where surgical treatment is not needed, but, on the other hand, in the majority of cases where complete rupture has occurred, either above or below the patella, the results from non-operative treatment are far from satisfactory. This is especially so when the rupture is above the patella. In forty such cases collected by Maydl there was complete recovery in sixty per cent. only, and in the twenty-three cases collected by J. B. Walker in seventy per cent. Contrast with this the final result after suture in the twenty-one cases collected by Walker with complete recovery in ninety per cent. Such operations, however, are not devoid of risk, and while so far no disastrous results have followed, it must not be forgotten that most of these patients have been under the care of surgeons of skill and experience. It is only by such men that the operation should be attempted, and if the proper conditions for an aseptic operation do not exist, it is probably wiser to adopt for a time, at least, a non-operative plan of treatment. Should this fail,

the suturing can be done at some later date, when the surroundings are more favorable for a successful issue.

When shall the operation be performed? The most favorable time is probably at the expiration of five or six days after the injury, when the acute stage of the joint hyperæmia has subsided. While a delay of several weeks does not seem to be advisable, yet it does not contra-indicate the operation. In the three operations here recorded, a delay of five weeks in the first case did not interfere with a perfect recovery, while in the second case a similar delay seemed to influence, in a slight degree, the final result.

Case I. M. McG., aged nineteen; admitted March 15, 1894. Seven weeks ago fell down a flight of stairs, the left knee being forcibly hyperflexed under him. He was able to walk home. On the following day the knee became swollen and painful. He sought treatment in a dispensary, where the diagnosis of sprain of the knee was made. Since then he walked to the dispensary twice weekly for treatment, which consisted of a bandage and counter-irritation. Unable to work on account of pain and disability. On examination there was found to be complete separation of the quadriceps extensor tendon from the superior border of the left patella, the distance being one inch and a half. Two fingers pressed into this space could clearly feel the anterior surface of the trochlea and the condyles of the femur. Flexion at knee unimpaired, but almost complete loss of extension. Slight swelling and tenderness of joint. End of tendon felt to be thickened.

March 20. *Operation.*—Fifty-five days after accident. Ether. Vertical incision six inches long at once entered the joint and exposed the lower part of the tendon and the patella. End of tendon decidedly thickened and hard, as if there had been a deposit of bone. The ragged and hardened end of the tendon trimmed off, as likewise the superior border of the patella. The tendon had been torn directly from its point of attachment to the bone, probably pulling off, with it some of the periosteum, so that no part of the tendon remained attached to the patella. The lateral expansions, however, were only partially torn off. Joint contained a few small partially organized blood-clots and some fluid, but was comparatively clean. Irrigation with hot salt solution. Three small openings were drilled through the upper end of the patella, into which, and then through the entire thickness of the tendon, were passed silk-worm-gut sutures.

The synovial membrane and the lacerated portions of the lateral expansions sutured with catgut, silk-worm sutures tied and incision closed by silk sutures without drainage. Plaster-of-Paris splint, the limb being hyperextended. On the following day considerable pain.

April 6. Temperature has not reached 100° F. since operation. Splint removed. Primary union. Sutures removed. Patella freely movable laterally. New splint.

April 23. Fenestrum cut in splint and daily massage. Patient out of bed.

May 5.—Splint removed. Passive motion. A few adhesions felt to snap.

May 23. Discharged cured. No stiffness. Rapidly regaining power of extension.

May, 1896. Reports that one leg is as good as the other. No disability. No pain. Extension and flexion perfect.

Case II. Rupture of Quadriceps Extensor Tendon of each Knee.

C. J. K., aged fifty-two. A short, heavy man, who has always been an awkward walker, fell downstairs on June 17, 1896, the right knee being flexed under him. Felt something break, but was able to rise and walk. Injury followed by some pain and swelling. His physician called it a sprained knee. Patient able, with great effort, to attend to his business as clerk, walking with the aid of crutches. On July 17, while hurrying to cross the street, fell and felt a snap in his left knee. He could not rise. With assistance he was helped to a carriage and taken home. Admitted to hospital on July 18. On examination is felt a depression, admitting two fingers between the superior border of the patella and the end of the quadriceps extensor tendon. Between these was felt distinctly the trochlea of the femur. Considerable swelling of knee; slight tenderness. Flexion good, but extension absolutely lost. Examination of the right knee reveals a similar condition, though with more exudation in the joint.

July 23. *Operation.*—Ether.

Left.—A curvilinear incision, concavity downward, was made across the limb about one inch and a half above the superior border of the patella and directly over the end of the tendon. Tissues œdematous and infiltrated with blood. Joint at once opened and found filled with blood-clots, shreds of tissue, and synovial fluid. Irrigated with salt solution. Rupture through the tendon found to be a transverse one, for the most part about half an inch above its

point of attachment to the patella, the tear being ragged, a strip some three inches long having been torn from the anterior layer of the tendon and remaining attached to the patella. The lateral expansions were almost completely torn off, small shreds being left attached to the sides of the bone. The gap between the patella and the end of the tendon measured an inch and a half. Persistent irrigation needed to remove the clots and shreds of tendon. Ends of tendon trimmed off by scissors, the tongue-shaped strip being removed with the exception of a half inch at the base. After the trimming there remained one-third of an inch of tendon attached to the patella. A double strand of silk was then passed through each end of the entire thickness of the tendon, and at the patella attachment through the edge of the bone itself. A suture of chromicised catgut was then passed on each side of the silk suture through the tendon, but without piercing the bone.

After thorough irrigation the lateral and anterior expansions were united by catgut sutures, and the three tendon sutures tied. The fascia was united by catgut and the skin by silk sutures. No drainage. As a result of the curved incision the line of skin-union was situated one inch superior to the line of union in the tendon.

Right.—A similar incision opened directly into the joint, which was filled with blood-clots and synovial fluid. The rupture of the tendon was a transverse one directly at its point of attachment to the patella. Laceration of the lateral expansions less extensive than in the left joint. Separation between superior border of patella and end of tendon one inch and a quarter. End of tendon trimmed off and border of bone freshened. As no part of the tendon had been left attached to the patella, a hole was drilled through the upper part of the bone and a double strand of silk passed through this and through the end of the tendon. Suturing completed as on left side. Considerable force was needed to approximate the end of the tendon to the patella. Plaster-of-Paris splint from ankles to upper part of thighs. For forty-eight hours considerable pain. Afterward patient comfortable. Temperature never rose to 100° F.

August 6. Fenestra, cut in splint. Primary union. Sutures removed. Patella movable laterally, the right less freely than the left.

August 12. Massage to each knee daily.

August 18. Splints removed. Passive motion ordered. Comfortable flexion to 50° F. in each knee.

August 25. Walks about with aid of crutches. Flexion of right knee somewhat limited.

September 2. Discharged cured. Walks unaided. Flexion and extension of left knee perfect. Flexion of right to 90° F. only. Extension perfect.

November 15. Patient walks as well as ever. Slight limitation to flexion of right knee. Flexion and extension of left knee perfect.

XVIII.

CONGENITAL UMBILICAL HERNIA.

By Andrew J. McCosh, M.D.

Baby McC.; male; born at term. Parents well formed and healthy, as are their three older children.

On birth a tumor the size of a large orange was noticed at the navel. Bowels had moved, and there had been no vomiting.

Admitted September 19, 1896—when thirty-six hours old. A well-developed baby. At the umbilicus a roundish tumor, diameter three and one-half inches; height above the abdominal wall, two and one-half inches. Color of surface, dark purplish, and covered not by skin, but only by the membranes of the cord, through which could be indistinctly seen the liver and intestines moving up and down on inspiration and expiration. Tumor partly reducible. Manipulation of tumor caused apparently no discomfort. Temperature, 100° F.; pulse, 130; respiration, 34. The treatment consisted in covering the hernia with rubber tissue wet with salt solution.

September 21. Baby apparently comfortable, taking plenty of nourishment. Bowels have moved. Temperature, 101° F. Operation advised.

September 23. Temperature 102° to 103° F. No vomiting, but

somewhat restless, and child looked ill. Covering of the hernia had assumed a dull-brownish appearance, and there was some odor.

September 24. *Operation.*—No anæsthetic. Surface of hernia covered by a foul sloughing membrane, without vitality, except near its attachment to the abdominal wall. This membrane was pulled off with forceps, which exposed to view the liver and transverse colon. The remainder of the membrane (covering of the hernia) was cut away by an incision carried around the base of the tumor, the liver and intestines being held back with hot gauze-pads. That portion of the liver which was contained in the sac was covered by a tenacious, partially sloughing exudate, which was scraped off with considerable difficulty, and as a result there was some superficial laceration of its surface, and some bleeding, which was controlled by pressure. When expulsive efforts were made by the baby, probably about one-third of its liver protruded through the gap in the abdominal wall. A few whiffs of chloroform were now given, so that the protruding viscera could be more easily returned. The incision around the base of the hernia had exposed the recti muscles, the edges of which, with the fascia and skin, were united by interrupted sutures of silk. Approximation of the edges of the wound was somewhat difficult on account of the tension. A strip of rubber tissue was inserted into the peritoneal cavity for drainage. There had been apparently no pain during the operation, which was followed by moderate shock only.

September 25. Seems comfortable; takes nourishment; no vomiting.

September 26. Pulse failing. Cyanosis. Death.

XIX.

THE PERFECTED METRO-URETHROTOME, WITH SOME OTHER INSTRUMENTS AND APPLIANCES OF USE IN GENITO-URINARY PRACTICE.*

By F. Tilden Brown, M.D.

The present metro-urethrotome differs from the one I showed in 1885 (described in the *New York Medical Journal* of February 12, 1887) (Fig. 1), in that the two screws which control respectively the

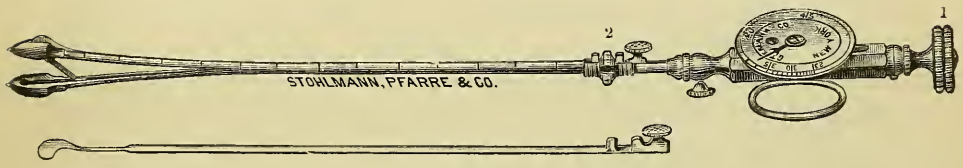


Fig. 1.

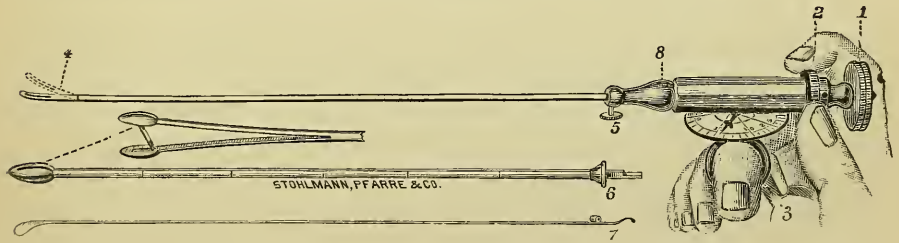


Fig. 2.—Component Parts of the Metro-urethrotome. 1, screw which controls the bulb; 2, screw which controls the blade; 3, ring for the third phalanx of middle finger; 4, hinged part of the lever which spreads the bulb (the slot in its centre permits the blade to be completely sheathed); 5, screw which binds 6 in place; 6 is that part of the staff where lever and blade are entered, and which fits into the handle at 5; 7, proximal end of knife which drops into a socket at 8.

bulb and the blade are now placed together at the proximal end of the dial and finger-ring. In this position the thumb and index finger have convenient control over both. The dial is now made

* Read before the Section on Genito-urinary Surgery of the New York Academy of Medicine, December 10, 1895.

circular, with duplicate figures on each side of the handle. The movable index is a double-pointed arrow. (Fig. 2.)

When the instrument was first presented I spoke of a possible inadequacy for those cases where the urethra was a continuous stretch of dense stricture tissue, and I stated that under such conditions the dilating urethrotome of Otis would unquestionably be more effective. While there is no reason to change this opinion, I desire at this time to state that, even in these extreme cases, I have been surprised and gratified to note the ready manner in which the metro-urethrotome has performed just such work. Since its introduction I have never used any other, excepting, of course, in cases where the preliminary use of a fine Maisonneuve became necessary to permit the closed bulb No. 15 French of the metro-urethrotome to be introduced; that is, an instrument five millimetres in diameter.

For detecting separate annular strictures and cutting them without inflicting unnecessary wounds upon the sound urethra just behind and in front of these bands, the metro-urethrotome seems to me pre-eminently adapted for the delicacy and accuracy required in these cases.

In my former method of urethrotomy, and that still generally prevailing, a bougie à boule detected the stricture, gauging its size and distance from the meatus. Then this measurement was approximately adjusted to the dilating urethrotome held by an assistant. Now the operator received and introduced the urethrotome to the depth indicated, dilated the urethra, and cut the desired length. Sheathing the blade again, the entire instrument was withdrawn, and olive-pointed bougies again inserted to test the result. Fresh measurements were made and again adjusted to the urethrotome, which is again used and alternated with the bulbs until the strictures are proven to be severed in an acceptable manner.

When so performed I have both experienced and noted the fact in the operations of others, that, after what aimed at being a careful measurement of the distance of the stricture, the latter was found not to have been cut at all, the blade having been exposed just anterior to it and a needless incision made. It is easy to understand such an error, because a stricture, on withdrawing the shoulder of a tight-fitting bulb through it, is brought half an inch or more nearer to the meatus than it really is; consequently, an allowance for this

should always be made in transferring the measurement from the stem of the bougie à boule to the urethrotome.

When the varying lengths of the penis and urethra incidental to *drawing* out the bougie and *pressing* in the urethrotome are considered, it would be strange if the blade of this instrument could always be exposed at just the point to be cut, since by the dilating urethrotome with parallel bars the possibility of locating the stricture by the sense of touch is denied.

If, on withdrawing a bougie à boule, the shoulder of which is held snugly by a stricture, a knife could be raised from this bulb and the latter spread a trifle more, so as to increase the stricture tension, the very best opportunity for cutting it without injury to adjacent parts would be offered. This is what the metro-urethrotome was devised to do.

The closed bulb is 5 millimetres in diameter, or 15 of the French scale. When fully spread it corresponds to 14 millimetres in diameter or 42 of the French scale. In the detection of a stricture it is introduced closed and with sheathed blade to the bulbo-membranous junction, there opened (by thumb and index finger, Fig. 3, screw 1) in accordance with the size of the urethra, and drawn slowly forward to the meatus. The varying coarctations and real strictures of the canal are noted. Again the bulb is closed and passed to the bulbo-membranous junction, there opened and drawn forward until the deepest stricture is engaged. Now the cutting properties of the instrument will be employed. When the bulb is firmly held by the stricture, the thumb and index finger turn screw 2 (Fig. 3), which exposes the blade on the uppermost half bulb, as shown in Fig. 1. With the left hand the operator extends the penis in its natural plane, while with the right hand the entire instrument is drawn forward under guarded traction by a slight tilting motion of the handle in the vertical plane. The snappy parting of the fibrous bands is readily felt. The blade is sheathed and the bulb further withdrawn to be engaged by any anterior strictures, where the blade is again exposed, etc. Then the bulb is at once passed to the bulbo-membranous region, and, here opened again, used to test the result of the cutting throughout. If the test proves that this has been inadequate at one or all points, these binding-places are subjected to a still deeper incision.

That the instrument is wholly controlled by one hand (the

middle finger passing but a short distance into the ring-handle), leaving the other hand free to manage the penis, as may be best suitable for the region being operated upon, will be recognized as an advantage. In addition to its combined utility for measurement and cutting, the delicate gradations of this latter feature can be noted when the stricture is engaged, for now the bulb may be spread tightly

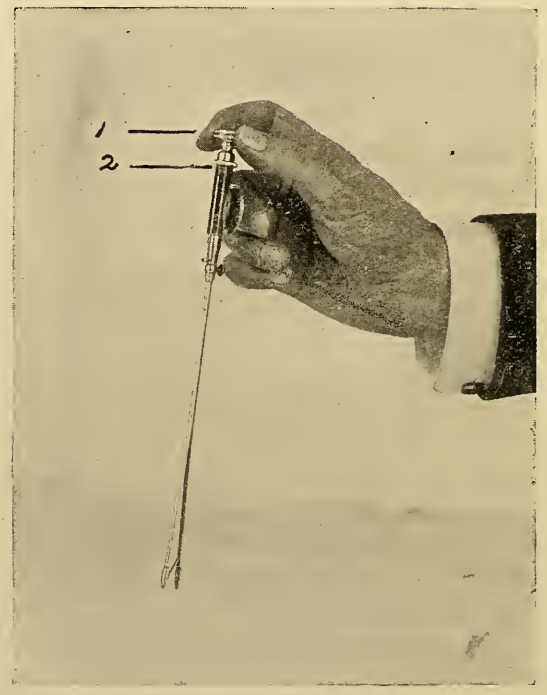


FIG. 3.—Position of the Fingers when the Instrument is Properly Held. 1, screw which controls the bulb ; 2, screw which controls the blade. The instrument is mainly supported by the distal phalanx of the middle finger passing through the ring-handle, while additional purchase is given by the thumb and first finger grasping the terminal screw.

while the blade is but sparingly exposed. Or, on the other hand, the blade may be freely exposed, while the bulb is but slightly spread. For an isolated ring stricture, of large calibre, the former way is best. In a urethra continuously infiltrated with cicatricial tissue, and requiring an incision of four or five inches, the latter method is preferable, but will here require repetition.

In either case, and with any instrument, I believe it is better to repeat the cutting a second or third time than to do an unnecessary amount by the first incision.

A MODIFIED MAISONNEUVE URETHROTOME.

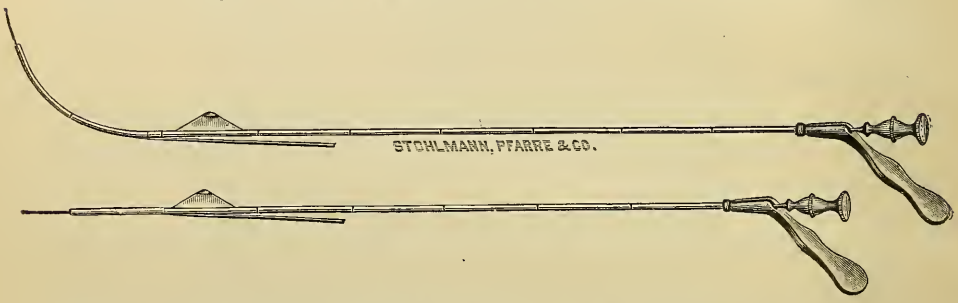
The original Maisonneuve urethrotome was intended to begin and complete an operation, as is evidenced by the great size of the largest of the three blades ordinarily sold with each staff. Experience has shown, I believe, that the instrument is best used only when the canal is so tightly strictured as to prevent the introduction of any of the dilating urethrotomes, and under these circumstances the smallest blade of the Maisonneuve should merely be ancillary to the latter because of their nicer adjustment for cutting to a desired depth at a particular region.

Therefore, I look upon the Maisonneuve as almost a necessity for the commencement of those urethrotomies where nothing larger than a No. 14 French sound can be passed, but a poor instrument with which to best complete such an operation.

Provided it be not an impassable one, the value of the Maisonneuve is then in a direct ratio to the tightness of a stricture which is to be cut. An evident exception may be taken to this statement in the case of soft inflammatory, but close, strictures, which, when once passed by a whalebone guide, are readily dilatable by sounds of increasing size, and often do not demand incision. I consider a tunnelled Maisonneuve staff which is passed on a whalebone guide much better than the usual staff made to follow a silk filiform attaching by screw to its tip. This latter not infrequently fails to reach the bladder, and, being so flexible, doubles up in the urethra, and may mislead the operator, resulting in a false passage being made while he believes that he is following a safe guide. Although far less liable to happen, the stiffer whalebone filiform, if not properly managed, can be doubled at the point of the tunnel, and cause the same mishap. It is perfectly easy to avoid such a possibility (after the whalebone guide has once reached the bladder) by constantly moving it backward and forward an inch or so; while the staff is advancing on this guide doubling will not occur, or, if it should, the fact could be recognized at once by slight retraction of the staff as the guide is drawn backward. The only other thing

which could cause the same apprehension would be the binding of the whalebone guide in the tunnel of the staff. And that there should be no chance of such annoyance, the filiforms to be used ought, before sterilization, to be tested through the tunnel of the staff, when they should travel with perfect freedom, because subsequent absorption of moisture from the bath or urethra may otherwise swell them sufficiently to bind.

The hilt of the Maisonneuve staff ordinarily consists of two small lateral rings; these afford a poor purchase, and at the same time endanger the fingers of the operator when inserting and removing the blade. The circumference of the staff commonly made is also inconveniently large. When a stricture requiring the preliminary use



FIGS. 4 and 5.—The Author's Modified Straight and Curved Maisonneuve Urethrotome.

of a Maisonneuve is in the anterior five inches, a straight staff is more convenient to manage than a longer curved one.

When the stricture is deeper, the latter design is essential.

The foregoing remarks will explain my reasons for designing the modified instruments here shown. (Figs. 4 and 5.)

The blades are small and the staffs are very slight, *i.e.*, No. 5 French. They are tunnelled smoothly, and not so sharp at either end of the tunnel as to endanger cutting or splitting the guide. An oblique handle below the staff insures the operator's fingers.

A GOOD HEAD-LIGHT.

In a paper read before this section of the Academy in March, 1891, entitled the "Ocular and Tactile Demonstration of Urethral Lesions," I showed a collection of various forms of illuminating ap-

paratus which were more or less serviceable for the purposes they were intended to fulfil. At that time my own preference was for a strong electric light which was reflected by an ordinary perforated concave head-mirror. The reasons for its preferment were the intensity of the illumination, the comparative freedom of both hands for making applications, and the absence of any apparatus near the entrance of the tube which could interfere with treatment of the canal. But this method had the objection that, as the tube or speculum was gradually withdrawn from the deeper parts of the urethra, its angle with the plane of the body had to be altered, and with this change of angle the direction of the rays of light from the electric lamp had also to be altered. To overcome this disadvantage I tried ineffectually to have several instrument-makers turn out an electric head-light which would throw the illumination directly into the bottom of the tube, but because of the faulty formula of the lens and its focussing in these attempted improvements, none produced rays of light which were at once parallel and strong enough to illumine the field at the bottom of a six-inch small calibre tube. I had about given up the possibility of this method of illuminating the urethra, when I found that Mr. Otto Kloppe was making for general use a head-light with an imported lens which, provided only one eye be used for the observation, could be so focussed as to illuminate the bottom of a six-inch Klotz tube of only No. 20 French. The light,

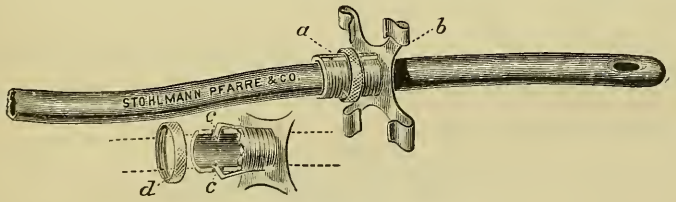


FIG. 6.—Perineal Tube-holder.

while not quite so powerful as that to be had by the reflective method, was, on the other hand, always moving with the eye and tube for this reason independent of any manipulation.

I take pleasure in showing this light; the wide range of its usefulness, besides that here alluded to, is apparent.

A PERINEAL AND A SUPRAPUBIC TUBE-HOLDER.

The continued use of the perineal tube-holder (Fig. 6) described in detail in *The Jour. of Cutan. and Gen.-urin. Dis.*, vol. xii., p. 257) has so well demonstrated its advantages, that I have had made on the same general principle a holder for the suprapubic drainage-tube. (Fig. 7.) This has the similar screw-flange, *d*, for compressing the spring-teeth against the rubber tube, thus holding it in place. The whole only differs in having a larger flat base-plate and a movable curved tube, *e*, for supporting the rubber tube in such a way as to prevent its angulation and loss of its proper siphonage properties, as is sure to happen when not protected in some adequate man-

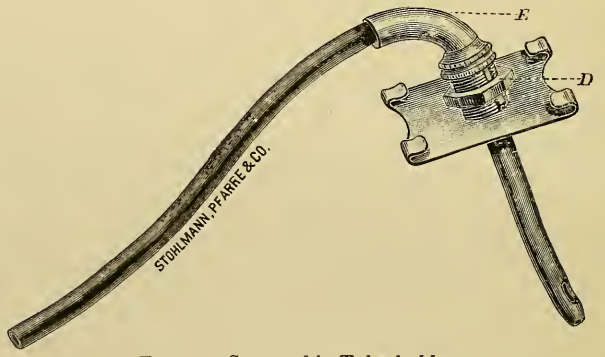


FIG. 7.—Suprapubic Tube-holder.

ner from the pressure of the dressings or clothes when the patient is going about, or from the weight of the long dependent tube when the patient is in bed.

A CATHETER HILT OR FENDER—A FOUR-WAY OR UNIVERSAL STOPCOCK.

This perforated rubber disk, which slips over a soft catheter just snugly enough to maintain its position against gravity, was made to protect the hands and clothes against soiling by the irrigation fluid as it returns from the urethra or bladder.

Without it the fluid follows along the catheter and trickles from its under convex surface in an erratic and unmanageable way. On the other hand, meeting the right-angled face of the fender an inch

or less in front of the meatus, the fluid can be accurately diverted into any receptacle. When I prescribe an irrigation outfit (Fig. 8) (which is generally to be used according to the Brewer method, with

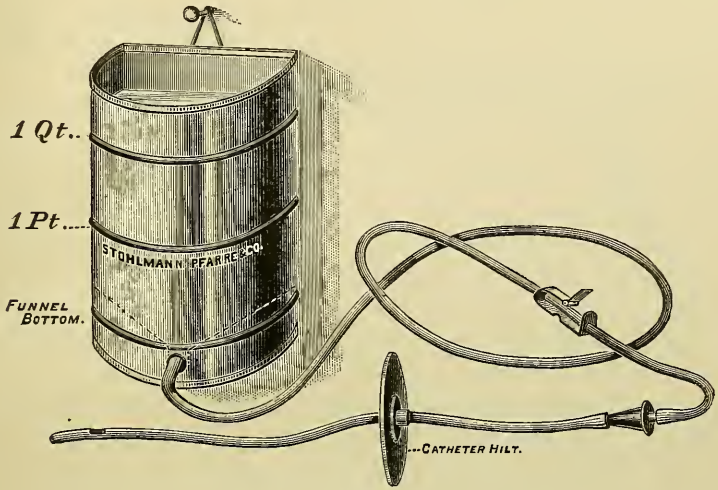


FIG. 8.

hot mercuric bichloride solution, 1 to 30,000–1 to 15,000, or hot potassium permanganate solution, 1 to 12,000–1 to 2,000), the apparatus consists of a pewter quart-can with a funnel bottom, four feet of rubber tubing, a snap shut-off, a hard-rubber connecting tip, a rubber catheter varying in size from No. 10 to No. 22 French, and a fender to fit with slight friction the particular catheter. All of these

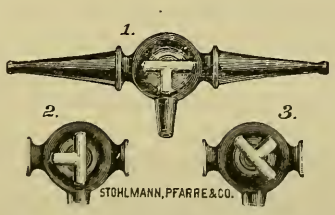


FIG. 9.—The Universal Stopcock.

parts being kept in stock by the maker, it is only necessary to indicate the proper-sized catheter.

It is sometimes necessary to caution the patient against inserting

the eye of the catheter beyond the external vesical sphincter. The fender is here also an aid, for by telling him or her to measure off a certain distance between the fender and the eye of the catheter, before inserting the latter, this precaution will be secured. This reference to both genders is made advisedly for the purpose of emphasizing the fact that physicians too often overlook the importance of local treatment of the female urethra in gonorrhœal infection.

When, instead of urethral, this apparatus is to be used for vesical, irrigation, whether by the physician or the patient, great convenience will be found in the substitution for the simple catheter connection of a rubber four-way stopcock connection. (Fig. 9.) There has long been a two-way stopcock in use, but its limitations, and the chance of a mis-adjustment, at times make it more troublesome than the alternate slipping on and off of the catheter. In the universal stopcock the possibility of not only the reversal of a current, but the conversion of a current to one wholly different, and the instantaneous closure of this particular current or all at the same time, will be understood by noting that the outlines of the **T**-thumb-piece correspond to the connecting channels in the interior of the bulb. When the three extremities of the **T** point toward the three visible outlets of the apparatus (1), everything is open. When the points of the **T** (representing the channels within), are directed so as not to correspond with any of the visible outlets (3), everything is closed.

The unbroken side of the **T** represents a blind face within. Consequently, when it is turned toward any of the visible outlets (2), that particular outlet is closed and the remaining two are open.

A PROBE-POINTED, GROOVED PERINEAL CATHETER FOR FACILITATING EXTERNAL URETHROTOMY.

This is intended as a substitute for, and improvement upon, Teale's probe-pointed gorget.

A grooved staff having been passed through the urethra to the bladder, the perineum and membranous urethra are opened upon it. At this stage it has been the general practice to insert into the groove of the staff either a probe, a female catheter, a probe-pointed gorget, or the finger. But the conditions presenting may make it difficult to pass to the bladder anything larger than a director, and because its *open* groove does not afford an issue for urine, a catheter

must then be passed upon the director to assure one's self of vesical entrance, and permit irrigation of the viscus before digital insertion, if that is to be done. If other incisions of the deep part of the wound or of the posterior urethra are necessary, the ordinary cylindrical catheter is a difficult director to cut along, and the finger is

FIG. 10.—The Probe-pointed, Grooved Perineal Catheter.

too large. To obviate the need of so many changes, the instrument (Fig. 10) has had combined in it the probe, the grooved director, and the catheter. In the majority of cases, as soon as the membranous urethra is opened, this instrument, with the bistoury, will answer all the requirements preparatory to the introduction of the finger.

AN ASEPTIC FILTERING ATTACHMENT FOR THE AIR-PUMP.

The advantages of air over water for bladder distention in suprapubic cystotomy was first graphically pointed out by Dr. A. T. Bristow of Brooklyn (*Annals of Surgery*, 1893, p. 667). I have used it exclusively where distention was necessary in this operation. And to make the procedure free from criticism on the score of germ introduction, although this is a very remote danger, I have had the accompanying air-filter (Fig. 11) made as an attachment to the ordinary small double-action bicycle pump, a much better thing, by the way, than the Davidson syringe for this purpose. The metal valves of the Davidson syringe while responding perfectly to the pressure of water, will often fail to work when air is the medium. The sterilizing or filtering chamber, C, has at each end a fine wire-gauze disk, B, to retain the cotton-filter in place ; the interior space of the cylinder is loosely filled with sterilized, borated, or iodoform cotton. After use the parts of the filter are unscrewed to be boiled with the

other instruments. The apparatus may prove a convenient one for aërial inflation when suitable cases of tuberculous peritonitis or cystitis are present.

I may allude to its utility in making the filtered air-test for rupture of the bladder as suggested by Keen, of Philadelphia (*Annals of Surgery*, 1890, p. 35), with air inflation of the bladder. Trendelenburg's position can be avoided if there is any reason for it.

By using air instead of water in the bladder, there is likewise no necessity whatever for the rectal water-bag, because of the difference of gravity of the two distending agents, and the greater resiliency of air, as compared with water, gives a diminished tax upon the walls of a damaged, weak bladder; besides, should it give way, the escape of noxious material under air-distention is much less than when this is suspended in, or surrounded by, water. A smaller degree of distention with air will have the same lifting effect upon the parietal peri-

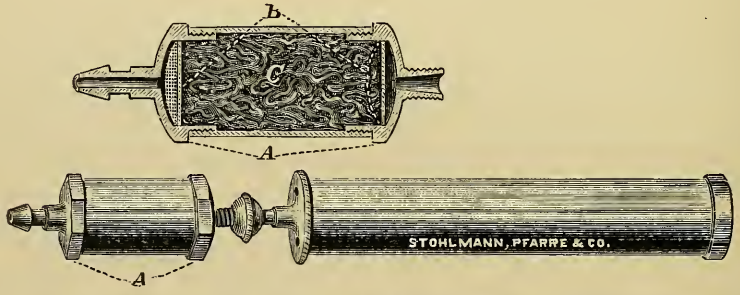


FIG. 11.—The Aseptic Air-Filter. A, screw ends of the cylinder; B, wire-gauze disks to retain cotton-filter in place; C, cotton chamber.

toneum, because of the higher position of the bladder, due to its lightness. It is my custom to pass a soft catheter into the bladder, empty and irrigate the cavity thoroughly, secure the catheter in place by a tape around the penis, attach the air-pump, and permit it to remain in position until the suprapubic incision has led down to the transversalis fascia or peritoneum; then seven or eight piston double movements of the air-pump will sufficiently lift the bladder to roll up the peritoneum and afford a good opportunity to select that region of the viscus most favorable for the introduction of lateral retention sutures. When the bladder-wall is divided between these, the usual gush of blood-stained, or soiled irrigation fluid is not encountered.

A BOILER AND SIPHON IRRIGATOR FOR THE OFFICE OR SMALL OPERATING-ROOM.

Every physician has at times to utilize some method of irrigation adapted to the particular requirements of his office practice. To anyone seeking a suggestion I will take the opportunity to describe

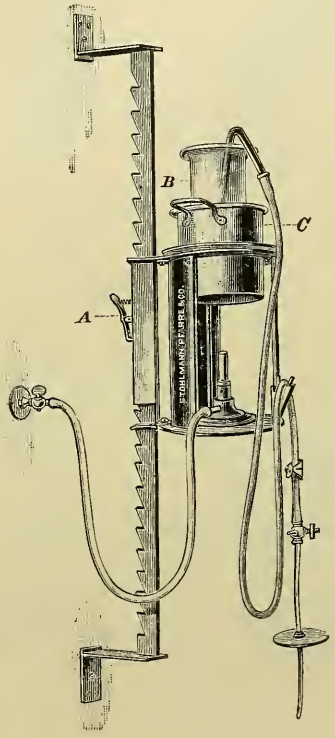


FIG. 12.—Author's Boiler and Siphon Irrigator for Office Use.

an apparatus which for several years has given me satisfaction. This consists of a rectangular brass upright, thirty-six inches long, notched along the back, and secured to the wall by brackets, the lower one being four feet from the floor. Upon this upright a double platform-elevator travels by a smooth-running rectangular collar. To lower the platform, the fingers grasp the collar and press the spring-catch (*A*). To raise it, the collar and spring do not need reaching for, a

hand below the platform merely shoving it to the desired height. A sheet of metal partly encircles the elevator on the back, to protect the collar and catch from heating. The lower platform holds a lamp, or, better, a Bunsen burner, attached to a gas outlet by tub-

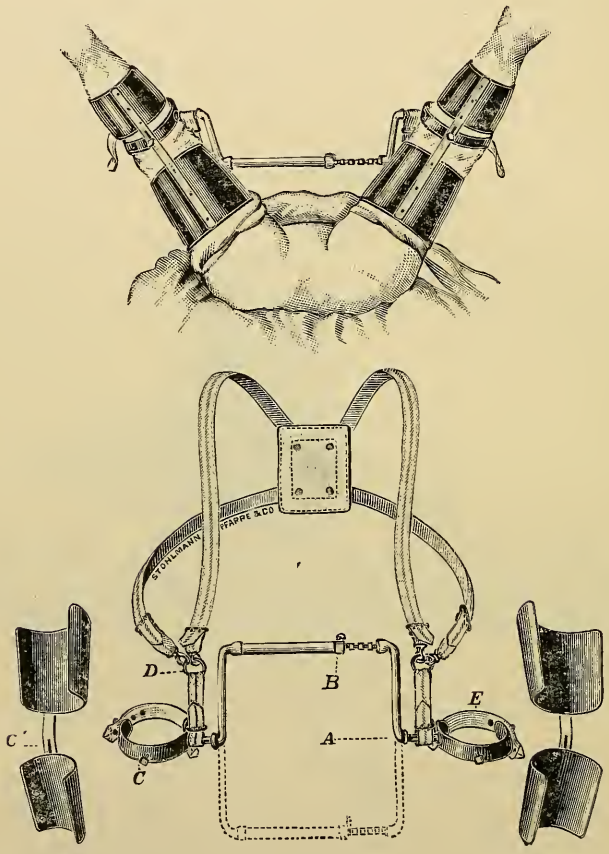


FIG. 13.

ing sufficiently long to permit full ascent and descent of the "lift." The top platform of the latter is an open disk into which fits a two-quart agate boiler made with a projecting flange around the middle. This vessel, fitted with a copper serial disked lid, serves as a sterilizer for catheters or small instruments; and at the same time as the hot-water bath for the irrigating fluid contained in the beaker or flask, the appropriate disked lid fitting closely to the beaker steady-

ing it, and conserving heat in the boiler. The irrigating fluid is drawn from the beaker or flask by siphonage. For this purpose I have found a hard-rubber tube better than one of glass or metal. The attached soft-rubber tubing has fitted to it any of the usual terminal conveniences. By shutting off the outflow before the beaker is emptied, and hanging up the tube as here shown (Fig. 12), it remains charged and ready to act when the end is immersed in a fresh solution. The irrigation finished, the hard-rubber siphon is hung at the notch supporting the rest of the tube. The beaker is removed from the boiler, then the catheter and other small instruments dropped into the latter for sterilization, a small spoonful of carbonate of soda having been added.

A SURGICAL CRUTCH, WITH ADJUSTABLE LEG-RESTS.

When I described this apparatus (*Ann. of Surg.*, May, 1895) I alluded to one particular feature, namely, the back-strap, as not only an important auxiliary to the neck-strap of Clover's instrument, but as the most advantageous way of exerting the major part, if not all, of the traction, after the apparatus was in place. When this was written I did not know that Dr. Frank LeMoyne Hupp, of Wheeling, W. Va., a former house-surgeon in the Presbyterian Hospital, had already demonstrated this point (see *Med. Rec.*, March 26, 1892, p. 363), and I now seize the opportunity to correct my omission, and with pleasure direct all credit to Dr. Hupp for introducing this valuable method of exerting traction when any form of Clover's crutch is used.

A HANDLED LIGATURE CARRIER AND ELEVATOR.

This is a modification of Sayre's double-ended periosteotome, where one beak is on the edge, the other on the flat. By giving

FIG. 14.—Ligature Carrier and Elevator.

the latter more curve, making both of the ends slighter, and with a generous-sized eye for a ligature near each point (Fig. 14),

the instrument becomes one of decided additional utility in separating vessels from their cellular surroundings, as in varicocele by the open method, the vas from the cord, in carrying ligatures through pedicles, broad ligaments and about omental adhesions, an elevator in depressed cranial fracture, etc. The eye is so large that it is just as easy, in many cases, to pass the ligature after the beak has pierced or separated the tissues to be ligated as to insert it before.

A HOLDER FOR HAGEDORN NEEDLES.

This, although not essentially a genito-urinary instrument, may with propriety be depicted here. The attempt was to make a holder somewhat on the principle of the original Hagedorn, which with vertical instead of horizontal jaws does not endanger breaking a curved needle, but to have the instrument lighter but equally tenacious in its grasp of needles of all sizes, at the same time reversable, so as to seize the needle with the jaws turned upward or downward. For most work the latter position is preferable, as on releasing their grasp the jaws drop the needle below, and thus they are not embarrassed by getting out from under the needle, or in danger of catching the suture material, and they are at the same time in the best position to move over the intervening tissues and to grasp downward upon the protruding needle-point. The perfect instrument will be recognized by two features:

First, when it is locked, with no needle in its jaws, these should be so closely apposed that, held to the light, this can scarcely be seen between them.

Second, when a large-sized needle is held in the jaws and the instrument closed, there should be spring enough in the handles to permit closing to take place without effort and consequent strain upon the distal jaw.

The instrument is made by Messrs. Slohlmann and Pfarre, with a movable spring which, besides spreading the handles, when unlocked serves as a check to the handles, becoming unhinged unintentionally. If one prefers to remove the spring, he will find that the size and shape of the handles require for their opening the intervention of the first or middle finger in lieu of the spring, as shown in the cuts. Held in the position which I think generally most advan-

tageous (Fig. 15), where the tip of the forefinger pushing forward as a wedge into the pivotal angle and performing the spreading func-

FIG. 15.—The Needle-holder About to be Opened by the Forefinger and Thumb.

tion, while at the same moment the thumb, flexing backward, opens the spring-catch. When held with the jaws in the reverse position

FIG. 16.—The Needle-holder About to be Opened by the Middle and Little Finger.

(Fig. 16) the back of the middle finger in the act of extension serves to spread the handles and jaws at the moment that the tip of the

little finger, more tightly flexed, opens the spring-catch, just as in the McBurney handle.

The only novel part of my instrument is that in front of the main hinge; but as the cuts are too small to permit a detailed description, it will suffice to say that one jaw has an extra hinge, consequently the leverage principle upon which the holder works can best be described in a word as that of the double inclined plane.

XX.

REPORT OF TWO CASES PRESENTING UNUSUAL DIFFICULTIES OF DIAGNOSIS.

By John A. Hartwell, M.D.

Case I. Perforating Ulcer of the Cæcum, Complicating Irreducible Umbilical Hernia.

T. D., female; aged forty-two; married; was admitted to the hospital on September 17, 1896, with the diagnosis of strangulated umbilical hernia.

The following history was then obtained, and later carefully corroborated by her friends and family.

She was the mother of four children, the youngest being seventeen years old. Her menstrual life had been normal. She had always enjoyed excellent health, and had no recollection of any intestinal trouble dating farther back than three days prior to admission to the hospital. An umbilical hernia had been present for twenty years, but had never given rise to any symptoms. No history pointing to syphilis or tuberculosis could be obtained.

On the afternoon of September 13, while out walking, and apparently in good health, she was suddenly seized with general abdominal cramps, centering most acutely about the hernial site. There was no change in the outward appearance of the hernia. Her bowels had moved normally that morning. No shock or collapse accompanied the cramps. From the first seizure with the cramps to the time of admission to the hospital, four days later, she suffered continuously, and the pain failed to yield to the remedies given by her physician. Her bowels could not be made to move again, though cathartics were freely administered and repeated enemata given. There had been no vomiting, and she had felt no nausea. She came to the hospital at about nine o'clock on the morning of September 17. Examination at that time showed the

patient with a temperature of 99.8° F., respiration of 38, and pulse of 116, of moderate tension and of good quality. The tongue was coated. Facies distressed. Nothing in her general appearance suggested sepsis.

The abdomen was distended, with increase of tympany, and was tender. No point of special tenderness could be found.

An umbilical hernia the size of an eight-months' fetal head was present, the skin on it being tense, adherent, and in places of a bluish color. An immediate operation on the hernia was advised and consented to by the patient and her family.

Before administering the anæsthetic the stomach was washed out, with the idea that if intestinal obstruction existed, this organ was probably filled with bilious fluid, and that lavage would prevent serious post-operative vomiting. The washing, however, returned clear, the stomach being empty. Ether was then administered, and, with the patient in the dorsal position, abdominal section was performed with the idea of relieving the strangulation supposed to exist in the hernia. No attempt at reduction by taxis was made. An elliptical incision about eight inches long was made so as to include within it the portion of skin adherent to the hernial sac. The incisions were carried through all the tissues down to the sac, and this was then dissected free on all sides as far as the constriction at the neck. The sac was then opened. It contained a large piece of adherent omentum, the circulation of which was poor, and a knuckle of small intestine, which looked perfectly healthy. There was no fluid in the sac. The adhesions were then separated and broken down till the omentum was freed, and this was then ligated at its healthy margin and amputated. The constriction at the neck of the sac was only moderately tight, admitting the index finger without difficulty. It was, however, enlarged by an incision, and an escape of gas and turbid fluid from the peritoneal cavity took place.

This aroused suspicion of the presence of some trouble aside from the hernia, the condition of the latter not accounting for any general peritoneal inflammation. Accordingly, after returning the omental stump and the intestine, an exploration of the general cavity was made. This showed the presence of a large quantity of purulent fluid, with fæces floating in it, and an extensive fibrinous

peritonitis. The matted condition of the omentum and intestines in the right iliac fossa pointed to this as the evident site of the real trouble. The usual abdominal incision for appendicitis was then made, and on opening the peritoneum a black gangrenous cæcum presented into the wound, and there was a free discharge of green fluid fæces. Examination of the cæcum showed the disease to involve nearly its whole extent, and in its outer wall was a perforation about one-half inch in diameter. The appendix vermiformis could not be safely reached, but it had no apparent connection with the trouble. The whole abdominal cavity was then washed out with hot normal salt solution, the edges of the cæcal perforation sewed to the skin for the formation of a fecal fistula, and large iodoform-gauze drains put in both wounds. The patient suffered very little shock from the operation, but gradually sank after it, and died in eighteen hours. The temperature at no time rose above 100° F.

Post-mortem examination showed a condition of very extensive peritonitis arising from the escape of intestinal contents through the cæcal perforations at the site of an ulcer. There was no involvement of the appendix vermiformis, and no other ulceration than the one mentioned was found in the intestinal tract.

The point to be emphasized as the result of the investigations, operative, and post-mortem in this case, is the fact that the hernia was in no way responsible for the patient's condition. A study of the case, with this in mind, develops two items of interest worthy of consideration.

First, one is struck with the entire absence of any data on which to make a correct diagnosis. Nothing in the patient's past history indicated any chronic intestinal disturbance, and in the absence of the hernia any explanation of her condition would have been at best a surmise. In the presence of the hernia all seemed simple, and the case might have been exhibited as a typical strangulation of an umbilical hernia, except that vomiting was absent. Perhaps this fact, and the empty condition of the stomach, which is certainly unusual in strangulated herniæ, should have received greater attention in reaching a conclusion.

The second feature of interest is found in the actual pathological condition present. A perforation of the cæcum from any cause is

a phenomenon rare enough to merit mention. When it occurs without giving rise to any symptoms prior to the actual escape of intestinal contents into the peritoneum, it is particularly interesting.

This feature of the ulceration is analogous to those of gastric and duodenal ulcer, which go on to perforation with entire absence of symptoms. Their exact pathology is as yet unsettled, and that of the more rare cæcal ulcers must be so considered. Except for the absolute knowledge to the contrary, obtained from operative and post-mortem examination, the death of this patient would undoubtedly have been attributed to an acute perforating appendicitis had not the umbilical hernia given a more easy but equally false explanation.

I am indebted to Dr. Charles K. Briddon for the opportunity to investigate, and the permission to report this case, it having occurred in his hospital service.

Case II. Suppurating Subdeltoid Bursitis with Typhoid Symptoms.

The liability of patients suffering from various infective processes, to develop symptoms suggestive of typhoid fever is a well-recognized fact in medical diagnosis. Medical literature gives abundant proof of the prevalence of mistakes in accepting a diagnosis of typhoid fever where the true lesion is tuberculosis or an acute infective inflammation in some part remote from the ileum. It is this fact which makes some sure and easily applied method of demonstrating the typhoid bacillus, or its ptomaïne, so imperative. The very recent discovery of the action of the blood from a typhoid patient on the life of the typhoid bacillus in a pure culture, promises to give us this method, and, it is hoped, will do much toward clearing up many mooted questions concerning the disease and its symptoms. The following case is deemed worthy of report, as one more illustration of the difficulty of an absolute certainty in the diagnosis of typhoid fever by the old methods. It occurred before the serum test was in use in New York.

W. F., aged twenty; male; was admitted to the hospital on September 16, 1896, and gave the following history.

Family History.—Mother died of tuberculosis.

Previous Personal History.—No tubercular, syphilitic, malarial, or rheumatic diathesis present.

When about fifteen years old he first noticed a swelling over the right shoulder, about the size of a billiard-ball. It had slowly increased in size up to the time of admission to the hospital, but had never, in any way, caused him inconvenience.

Present Illness.—This began about three weeks prior to admission to the hospital, with chills similar to that of malaria, three occurring in one week.

He took one ten-grain dose of quinine, and had no more chills. He, however, continued to suffer from marked malaise, had one nose-bleed, a severe diarrhœa—the character of the stools not being noted—and more or less headache. On admission to the hospital he complained of "feeling sick," and having some headache. No change in the condition of the tumor on his shoulder had attracted his attention. The physical examination recorded at the time of his admission was as follows:

Patient is poorly nourished, and anæmic. Tongue moist and clean on tip, coated and dry elsewhere. Somewhat apathetic, but the facies not typhoid in character.

Heart, normal. *Lungs*, some general bronchitis. *Abdomen*, soft, full, not tender, and no increase of tympany. *Spleen*, percusses large, edge felt below ribs.

Surface.—On the skin of the abdomen are a few spots resembling the eruption of typhoid fever.

Situated over the outer and upper part of the right arm, and reaching above the acromium, is a spheroid tumor about four inches in diameter. It is neither tender nor painful. The skin covering it is normal in appearance and movable over the tumor. The tumor is movable on deeper parts. Its consistence is fluctuating, with hard masses in the tumor wall. Its exact relation to the deltoid muscle is undetermined. At 8 P.M. the temperature was 101.5° F.; pulse, 92; respiration, 28. Urine normal.

Treatment.—Confinement to bed and fluid diet.

On September 17 he passed about two drachms of bright red blood in his stool, the latter not being typhoid in character. A careful questioning and examination gave no indication of the presence of hemorrhoids. For a week after his admission there were no new developments. Then, on September 24, the tumor over his shoulder began to show signs of inflammation, and three days later showed

unmistakable evidence of undergoing suppuration. The temperature and pulse-rate during that time are given below.

Date.	4 A.M.		12 M.		8 P.M.	
	Temperature.	Pulse-rate.	Temperature.	Pulse-rate	Temperature.	Pulse-rate.
September 17	104.0	88	101.6	92	103.6	84
" 18	101.5	84	101.0	92	103.0	82
" 19	100.5	84	101.0	90	102.8	100
" 20	101.4	88	102.0	82	102.2	88
" 21	101.8	88	98.7	88	102.2	96
" 22	100.6	100	101.2	96	102.3	96
" 23	99.8	80	101.8	96	100.4	56
" 24	99.0	48	101.7	100	101.6	100
" 25	99.4	92	101.0	92	102.3	96
" 26	99.8	64	100.7	88	102.0	96

This course of temperature, the dry tongue, the intestinal hemorrhage, the eruption, and the enlarged spleen, all corroborated the diagnosis of typhoid fever until the active inflammatory process going on in the tumor over the shoulder suggested this as the primary cause of his sickness. Operation was then advised.

September 27. He was etherized and an incision made over the tumor. On dissecting the latter out it proved to be a suppurated bursitis, situated under the deltoid muscle and communicating with the joint. The bursa itself contained about eight ounces of pus, but the joint cavity was uninfected, inflammatory product having shut it off. This protection was necessarily broken down in removing the bursa, but the infection was kept from the joint by means of sponges. After thoroughly washing the whole operative field with 1 to 1,000 bichloride solution and normal salt solution, iodoform-gauze tampons were packed in the wound and the greater part of it left unsutured. A sterile dressing was applied and the arm immobilized. The dressing was first changed at the end of seven days, and then the wound was granulating well, and the joint cavity was once more closed by granulations and adhesions. A new dressing was applied and the arm left unconfined.

Immediately after the operation the patient began to recover from his malaise, the tongue cleaned up, the bowels became normal, and at the time of the first dressing he was sitting up and eating

heartily. The temperature and pulse during the week were as follows :

Date.	4 A.M.		12 M.		8 P.M.	
	Temperature.	Pulse-rate.	Temperature.	Pulse-rate.	Temperature.	Pulse-rate.
September 27	....	..	....	..	98.0	100
" 28	99.3	92	100.0	98	101.6	116
" 29	100.0	96	100.0	94	99.8	96

September 30 to October 4. Temperature reached 99.5° F. in afternoon, and was normal thereafter, with pulse 70.

There were no constitutional disturbances of any kind after this, and the local condition progressed rapidly and favorably. At the end of three weeks the wound was practically healed, and complete function, except for some weakness of the deltoid muscle, restored to the parts, motion having been first started on the eleventh day.

The patient's rapid recovery from constitutional symptoms, after the removal of the bursa, demonstrated this to have been the cause of his sickness, and his condition to have been one of pyogenic and not of typhoid infection, as was at first supposed.

An explanation of the presence of the general symptoms so long before any local manifestations of suppuration in the bursa appeared, was found on examination of the bursal sac after its removal. This examination showed the suppuration to have begun in the deepest part, under the attachment of the deltoid muscle. Hence its tardy appearance on the surface.

I am indebted to Drs. Thompson and McCosh for the privilege of investigating, and permission of reporting this case, it having occurred in their hospital services.

XXI.

A REPORT ON CASES OF SUNSTROKE DURING THE SUMMER OF 1896.

By N. R. Norton, M.D.,
HOUSE PHYSICIAN.

The unusually hot weather of the past summer afforded an opportunity for the study and treatment of sunstroke which has seldom, if ever, been equalled in New York City.

The immediate institution of proper and vigorous treatment in insolation is of more vital importance to the patient than in any other disease. It thus stands alone as the disease in which the results of hospital treatment are so much more satisfactory than in private practice. This is largely due to a very efficient ambulance service, and a thorough equipment for the management of such cases.

The following cases occurred in the wards of the Presbyterian Hospital, in the service of Dr. J. P. Thornley, with whose kind permission they are reported.

During the six days from August 8 to 13, inclusive, about one hundred and ten cases were brought to the hospital suffering, more or less, from the excessive heat. About fifty of them were of the milder forms, and are not included in the report. They were given cold water, with which they sponged their heads and chests, were kept in a cool room, and left the hospital in from fifteen minutes to twelve hours. The tabulated cases include only those with a temperature on admission of 104° F., or over, which was evidently rising. Of these there were sixty-one, with nine deaths; a mortality of 14¾ per cent.

Owing to the great pressure of work the records of eleven cured cases were lost, so the tables give the detailed account of but fifty cases.

Case.	Name.	Result.	baths.	Variety.	Stay in hospital.	Alcoholic habit.	Complications and prominent symptoms.	Remarks.
1	W. U.	Cured.	.	.....	10 days.	Moderate.	Vomiting.	
2	C. S.	Died.	4	Sponge at 75°.	19 hrs.	"	"	
3	M. S.	Cured.	2	" of ice-water and at 75°.	44 days.	Marked.	Meningeal symptoms.	Bled.
4	M. McG.	Died.	2	Ice sponge.	9 hrs.	"	Convulsions.	
5	J. C.	Cured.	.	.....	2 days.	Moderate.		
6	P. B.	"	.	....	16 hrs.	"		
7	A. K.	Died.	.	.....	7 min.	Marked.	Convulsion, vomiting.	Asphyxiated.
8	A. N.	Cured.	4	Sponge of ice-water and at 75°.	13 days.	"	Furunculosis, obesity.	Hemorrhage from mouth, stomach, and rectum.
9	M. C.	"						
10	T. P.	Died.	3 8	Sponge at 75°. " of ice-water.	48 hrs. 60 "	? Moderate.	Broncho-pneumonia.	One previous attack.
11	J. M.	"	2	" " "	6 "	?	General convulsions.	Sponge-baths inadequate.
12	M. H.	"	.	....	2½ "	Marked.	Nephritis, cirrhosis, adherent pericardium.	
13	J. C.	Cured.	2	Ice tub and sponge.	40 "	"	General convulsions.	Good effect of second tub-bath.
14	A. G.	"						
15	H. D.	"	.	....	39 "	Moderate.		
16	F. S.	"	2	Ice sponge.	40 "	"		
17	T. W.	"	4	Sponge at 75°.	2 mos.	"	Ulcer of leg.	General debility.
			2	Ice sponge.	36 hrs.	None.		
18	A. B.	"						
19	J. T.	"	1	" "	36 "	Moderate.	Alcoholic on admission.	
20	J. G.	"	1	" "	18 "	Marked.	" " "	
21	M. B.	"	1	" tub.	32 "	"	Furunculosis, delusions.	
22	M. K.	"	.	.....	33 days.	?		
23	P. S.	"	.	.....	32 hrs.	Moderate.		
24	C. S.	"	.	....	20 "	"		
25	V. D.	"	1	Ice sponge.	26 "	"		
26	M. McN.	"	1	" "	18 "	?		
27	J. H.	Died.	2	" "	28 "	Moderate.	Alcoholic on admission.	Convulsions.
28	M. M.	Cured.	1	" tub.	8 "	Marked.		
29	F. R.	"	1	Sponge at 75°.	8 days.	None.		
30	— S.	"	2	Ice sponge.	41 hrs.	Moderate.		
31	P. G.	"	.	.....	16 "	Marked.	Scalp wound.	
			.	.....	17 "	None.	....	Good effect of second tub-bath.
32	S. M.	"						
33	T. K.	"	2	Ice tub and sponge.	2½ days.	Moderate.		
34	J. B.	"		.....	18 hrs.	"		
35	J. K.	"	.	.....	12 "	?		
			.	.....	14 "	Moderate.		
36	E. S.	Died.	6	1 Ice tub. 2 Sponge. 13 Sponge at 70°.	8 days.	Marked.	Pulmonary congestion.	Bled.
37	J. T.	"						
38	J. C.	Cured.	2	Ice sponge.	8 hrs.	Moderate.	Alcoholic on admission.	Moribund.
39	J. F.	"	1	Sponge at 75°.	38 "	"		
40	B. R.	"	7	" " "	10 days.	None.		
41	B. C.	"	3	Ice sponge.	6 "	Marked.		
42	W. K.	"	.	.....	2 "	Moderate.	Alcoholic on admission.	
43	C. K.	"	.	.....	17 hrs.	"		
44	G. J.	"	.	.....	15 "	"		
45	J. M.	"	.	.....	24 "	Marked.	Delirium tremens.	
46	F. H.	"	.	.....	14 days.	?		
47	T. C.	"	.	....	3 "	Marked.	Alcoholic on admission.	Tubercular pleurisy.
48	W. P.	"	1	Ice sponge.	36 "	"	" " "	Lavage.
49	J. W.	"	1	" tub.	36 hrs.	"		
			.	.....	24 "	Moderate.		
50	M. R.	"						
			.	.....	17 "			

TABLE OF CASES OF SUNSTROKE.

Case.	Name.	Result.	Male or female.	Age.	Occupation.	Admitted.	Time.	From onset to admission.	Temperature, degrees Fahrenheit, on admission.	Mental condition on admission.	Pulse.	Respiration.	Initial bath.	Duration.	Temperature, degrees Fahrenheit, when removed.	Lowest temperature, degrees Fahrenheit.	Time of lowest temperature after bath.	When first rational after bath.	Time of 1st major rise of temperature after lowest temperature.	Height of 1st major rise of temperature, degrees Fahrenheit.	Number of subsequent baths.	Variety.	Stay in hospital.	Alcoholic habit.	Complications and prominent symptoms.	Remarks.
1	W. U.	Cured.	Male.	32	Baker.	July 14.	10.00 P.M.	4 hrs.	105.6	Coma.	Rapid, weak.	Stertorous.	Ice sponge.	17 min.	100.6	97.7	38 min.	40 min.	7 hrs.	102.4	..	.....	10 days.	Moderate.	Vomiting.	
2	C. S.	Died.	"	42	Carpenter.	Aug. 8.	7.00 "	15 min.	112.0	"	" "	"	" "	45 "	101.0	95.0	2 hrs.	Never.	4 "	105.0	4	Sponge at 75°.	19 hrs.	"	"	
3	M. S.	Cured.	"	47	Bartender.	" "	9.40 A.M.	" "	115.0	"	"	Gasping.	" "	33 "	104.5	99.5	32 min.	24 hrs.	5 "	105.6	22	" of ice-water and at 75°.	44 days.	Marked.	Meningeal symptoms.	Bled.
4	M. McG.	Died.	"	24	Seaman.	" "	3.45 P.M.	10 "	112.0	"	Imperceptible.	"	" "	50 "	101.2	100.0	30 "	Never.	2½ "	105.0	2	Ice sponge.	9 hrs.	"	Convulsions.	
5	J. C.	Cured.	"	..	Laborer.	" "	4.00 "	12 "	109.0	"	Rapid, bounding.	Stertorous.	" "	15 "	101.2	98.0	30 "	10 min.	5 "	103.2	..	.....	2 days.	Moderate.		
6	P. B.	"	"	34	Milk-hand.	" "	" "	9 "	104.5	Conscious.	Normal.	Sponge at 75°.	30 "	102.3	99.2	75 "	..	7 "	101.8	..	.....	16 hrs.	"		
7	A. K.	Died.	"	..	.....	" "	5.30 "	7 "	109.0	Coma.	"	Stertorous.	Ice tub.	5 "	.....	.....	.....	Never.	.....	.....	..	.....	7 min.	Marked.	Convulsion, vomiting.	Asphyxiated.
8	A. N.	Cured.	"	42	Cigar-maker.	" "	1 hr.	1 hr.	110.0	"	" weak.	"	" "	65 "	102.0	99.8	20 min.	12 hrs.	3 hrs.	106.0	4	Sponge of ice-water and at 75°.	13 days.	"	Furunculosis, obesity.	Hemorrhage from mouth, stomach, and rectum.
9	M. C.	"	"	..	.....	" "	10. 11.00 A.M.	10 min.	109.0	"	"	bounding.	"	45 "	103.5	94.0	75 "	2 "	8 "	102.9	..	Sponge at 75°.	48 hrs.	?		
10	T. F.	Died.	"	70	.....	" "	11.30 "	1 hr.	108.0	Semi-conscious, delirious.	"	weak.	Rapid.	35 "	103.8	93.0	75 "	15 min.	7½ "	104.2	2	" of ice-water.	60 "	Moderate.	Broncho-pneumonia.	One previous attack.
11	J. M.	"	"	25	.....	" "	12.15 P.M.	" "	110.2	Coma.	"	full.	Stertorous.	50 "	103.0	97.1	45 "	Never.	1½ hr.	108.9	2	" "	6 "	?	General convulsions.	Sponge-baths inadequate.
12	M. H.	"	"	43	Laborer.	" "	1.00 "	6 "	110.2	"	"	weak.	Gasping.	25 "	103.4	94.5	40 "	"	1½ "	102.7	..	....	2½ "	Marked.	Nephritis, cirrhosis, adherent pericardium.	
13	J. C.	Cured.	"	36	.....	" "	4.00 "	10 "	112.0	"	"	full.	Stertorous.	30 "	103.0	98.8	65 "	4 hrs.	2 hrs.	105.2	2	Ice tub and sponge.	40 "	"	General convulsions.	Good effect of second tub-bath.
14	A. G.	"	"	30	Stone-cutter.	" "	5.00 "	15 "	108.0	"	"	"	"	17 "	103.8	99.5	60 "	30 min.	3½ "	102.0	..	.....	39 "	"		
15	H. D.	"	"	38	Driver.	" "	5.45 "	10 "	109.6	"	"	"	"	18 "	103.5	98.0	32 "	15 "	1½ hr.	103.0	2	Ice sponge.	40 "	"		
16	F. S.	"	"	60	Cigar-maker.	" "	7.35 "	1 "	107.4	"	"	weak.	"	10 "	104.0	94.0	25 "	15 "	70 min.	103.7	4	Sponge at 75°.	2 mos.	"	Ulcer of leg.	General debility.
17	T. W.	"	"	54	Cashier.	" "	7.40 "	5 "	108.2	Semi-conscious, delirious.	"	full.	"	15 "	103.6	98.5	33 "	5 "	35 "	102.0	2	Ice sponge.	36 hrs.	None.		
18	A. B.	"	"	35	Carpenter.	" "	10.20 "	10 "	109.6	Coma.	"	bounding.	"	25 "	103.0	99.0	50 "	10 "	.....	..	" "	36 "	Moderate.	Alcoholic on admission.	
19	J. T.	"	"	..	.....	" "	11. 12.30 A.M.	3 hrs.	109.5	"	"	weak.	Gasping.	28 "	104.0	99.0	72 "	20 "	85 min.	105.0	1	" "	18 "	Marked.	" "	"
20	J. G.	"	"	31	Laborer.	" "	12.50 "	10 min.	109.5	"	"	"	Stertorous.	28 "	105.0	99.0	72 "	4 hrs.	8 hrs.	105.0	1	" tub.	32 "	"	Furunculosis, delusions.	
21	M. B.	"	Female.	68	Domestic.	" "	9.30 "	5 "	106.4	"	"	"	"	20 "	103.6	98.8	50 "	30 min.	8 hrs.	102.0	..	.....	33 days.	?		
22	M. K.	"	Male.	35	Policeman.	" "	10.00 "	15 "	105.0	Conscious.	"	full.	Normal.	25 "	103.5	99.0	13 hrs	.....	2 "	.....	..	.....	32 hrs.	Moderate.		
23	P. S.	"	"	..	.....	" "	1 00 P.M.	10 "	104.0	"	"	"	Sponge.	10 "	102.0	97.0	35 min.	.....	1 hr.	100.0	..	.....	20 "	"		
24	C. S.	"	"	..	.....	" "	1.03 "	" "	107.8	Coma.	"	"	Stertorous.	30 "	102.7	98.3	45 "	20 min.	7 hrs.	103.0	1	Ice sponge.	26 "	"		
25	V. D.	"	"	30	Laborer.	" "	2.30 "	15 "	109.6	"	"	"	"	20 "	103.6	98.5	60 "	10 "	2 "	104.0	1	" "	18 "	?		
26	M. McN.	"	"	38	"	" "	3.00 "	1 "	112.2	"	"	weak.	Gasping.	50 "	101.0	98.5	15 hrs.	1½ "	4 "	104.2	2	" "	28 "	Moderate.	Alcoholic on admission.	Convulsions.
27	J. H.	Died.	"	..	.....	" "	3.00 "	10 "	112.0	"	"	"	"	26 "	103.5	97.4	50 min.	Never.	4 "	105.0	1	" tub.	8 "	Marked.		
28	M. M.	Cured.	Female.	20	Domestic.	" "	4.00 "	15 "	109.8	"	"	full.	"	6 "	103.7	100.0	70 "	20 min.	3½ "	103.0	1	Sponge at 75°.	8 days.	None.		
29	F. R.	"	Male.	31	Stableman.	" "	4.30 "	1 "	110.1	"	"	"	Stertorous.	40 "	103.5	97.0	60 "	10 "	2 "	103.0	2	Ice sponge.	41 hrs.	Moderate.		
30	— S.	"	"	..	.....	" "	4.40 "	" "	104.0	Conscious.	"	"	Normal.	25 "	.....	.....	.....	.....	.....	.....	..	.....	16 "	Marked.	Scalp wound.	
31	P. G.	"	"	33	Driver.	" "	5.00 "	10 "	109.5	Coma.	"	"	Stertorous.	20 "	103.0	95.0	50 "	25 min.	2 hrs.	100.0	..	.....	17 "	None.	.....	Good effect of second tub-bath.
32	S. M.	"	Female.	19	Domestic.	" "	" "	20 "	110.4	"	"	weak.	Gasping.	27 "	103.0	97.4	43 "	4 hrs.	3½ "	103.8	2	Ice tub and sponge.	2½ days.	Moderate.		
33	T. K.	"	Male.	..	.....	" "	" "	10 "	107.0	"	"	full.	Stertorous.	15 "	102.4	98.2	25 "	15 min.	.....	.....	..	.....	18 hrs.	"		
34	J. B.	"	"	..	.....	" "	6.00 "	10 "	105.2	Conscious.	"	"	Rapid.	8 "	101.0	99.8	60 "	.....	.....	.....	..	.....	12 "	?		
35	J. K.	"	"	..	.....	" "	" "	8 "	106.0	Coma.	"	"	Stertorous.	7 "	103.2	95.0	20 "	15 min.	2 hrs.	100.5	..	.....	14 "	Moderate.		
36	E. S.	Died.	"	47	Wood-carver.	" "	7.00 "	15 "	109.5	"	"	weak.	Gasping.	20 "	104.0	99.8	40 "	3 days.	2½ "	104.2	16	{ 1 Ice tub. 2 Sponge. 13 Sponge at 70°. }	8 days.	Marked.	Pulmonary congestion.	Bled.
37	J. T.	"	"	..	.....	" "	" "	4 "	111.0	"	"	"	"	41 "	105.0	98.0	40 "	Never.	1 hr.	104.6	2	Ice sponge.	8 hrs.	Moderate.	Alcoholic on admission.	Moribund.
38	J. C.	Cured.	"	55	Laborer.	" "	7.30 "	15 "	105.2	Conscious.	"	full.	Rapid.	15 "	103.0	99.3	75 "	.....	15 min.	102.4	1	Sponge at 75°.	38 "	"		
39	J. F.	"	"	27	Driver.	" "	7.35 "	10 "	109.0	Coma.	"	"	Stertorous.	15 "	103.0	97.8	30 "	10 min.	1½ hr.	105.0	7	" " "	10 days.	None.		
40	B. R.	"	Female.	27	Domestic.	" "	12. 9.00 A.M.	40 hrs.	109.8	"	"	"	"	15 "	103.6	98.0	35 "	15 "	3 hrs.	102.5	3	Ice sponge.	6 "	Marked.		
41	B. C.	"	"	57	"	" "	12.15 P.M.	12 "	103.0	Stupid.	"	"	Normal.	Sponge at 70°.	10 "	101.5	98.8	24 hrs.	.....	.....	..	.....	2 "	Moderate	Alcoholic on admission.	
42	W. K.	"	Male.	51	Printer.	" "	3.00 "	30 min.	106.0	Semi-conscious.	"	"	Stertorous.	Ice tub.	30 "	102.6	98.5	30 min.	10 min.	.....	..	.....	17 hrs.	"		
43	C. K.	"	"	40	.....	" "	5.00 "	15 "	106.1	Coma.	"	"	"	"	30 "	99.4	95.0	1 hr.	20 "	1½ hr.	101.0	..	.....	15 "	"		
44	G. J.	"	"	35	Baker.	" "	7.00 "	20 "	109.0	Wild delirium.	"	"	"	"	25 "	103.2	100.0	35 min.	20 "	.....	.....	..	.....	24 "	Marked.	Delirium tremens.	
45	J. M.	"	"	30	Driver.	" "	8.00 "	13 "	107.9	Coma.	"	"	"	"	17 "	103.2	96.5	25 "	20 "	3 hrs.	102.0	..	.....	14 days.	?		
46	F. H.	"	"	33	Laborer.	" "	9.00 "	15 "	104.0	Stupid.	Slow, "	Rapid.	" sponge.	18 "	101.7	99.0	22 "	.....	1½ hr.	101.0	..	.....	3 "	Marked.	Alcoholic on admission.	Tubercular pleurisy.
47	T. C.	"	"	34	"	" "	12.05 A.M.	10 "	107.3	Coma.	Rapid, weak.	Gasping.	" tub.	20 "	101.3	98.0	30 "	24 hrs.	5 hrs.	103.0	1	Ice sponge.	36 "	"	" "	Lavage.
48	W. P.	"	"	40	Waiter.	" "	3.00 "	30 "	109.5	"	"	"	"	15 "	101.4	97.1	50 "	6½ "	2 "	103.0	2	" tub.	36 hrs.	"		
49	J. W.	"	"	27	Soldier.	" "	5.00 P.M.	15 "	108.9	Semi-coma, delirious.	"	full.	Stertorous.	35 "	104.8	99.8	40 "	5 min.	.....	.....	..	.....	24 "	Moderate.		
50	M. R.	"	"	..	Driver.	" "	7.30 "	" "	104.8	Conscious.	"	"	Rapid.	Sponge at 70°.	20 "	100.5	99.0	30 "	.....	.....	.....	..	.....	17 "			

Etiology.—The cumulative action of the heat was pronounced, it being the third day of excessively high temperature and humidity, when the first cases occurred. Then on six successive days there were two, six, ten, twenty-one, seven, and four, respectively. Of the fifty cases, twenty-seven were between three and eight o'clock in the afternoon, four from eight o'clock to midnight, four from midnight to 6 A.M., and six more before noon. From noon to 3 P.M. nine cases were brought in. Thus there were forty cases from noon to midnight, and but ten from midnight to noon. There were but few women, fifty-six of the sixty-one cases being men.

The occupation of most of the patients involved exposure to the sun, though in a fair number, including all the women, this was not so.

The average age was thirty-six years, the oldest being seventy and the youngest nineteen years of age.

With few exceptions the patients were large framed, well muscled, and robust individuals. Those that were the reverse, as a rule did poorly.

Only one (Case 10) had had a previous attack, and that was on the day before admission. His was a fatal case.

The use of alcohol seemed to have a direct and unfavorable influence. The habit was marked in thirty-two per cent., moderate in forty-six per cent., denied in ten per cent., and in the remaining twelve per cent. no history was or could be obtained. Eight cases were markedly alcoholic on admission, and of these four died.

Prodromata.—Definite histories were next to impossible to obtain. Most of the cases had but slight warning, such as dizziness, sense of fulness in the head, and decrease or suspension of sweating. There were a few exceptions, however, the most notable being Case 40. The case was that of a domestic, aged twenty-seven. Two days before the attack she was at work in the house washing and ironing. In the afternoon she felt excessively tired, had some headache and went to bed. The next day, after sleeping all night, she felt but little improved, but was up and about at different times during the day. She slept most of that night and waked about 7 A.M. of the day of her attack. After that she remembered nothing. At 9 A.M., about forty hours after the first symptoms, she was brought to the hospital in coma, with a temperature of 109.8° F.

Onset.—In most of the cases (forty-four) the onset was sudden

with immediate loss of consciousness. It varied from thirty minutes to forty hours in the other six, with symptoms referred to above.

Symptoms on Admission.

Mental Condition.—Seven cases, with an average temperature of 104.8° F., varying from 104° to 105.6° F., were conscious. Two, with temperatures of 104° and 105° F. were stupid and quiet. Delirium and semicoma was present in five cases, ranging from 106° to 109° F., with an average temperature of 108° F. Coma characterized the remaining thirty-six cases, whose temperature averaged 109.1° F., the lowest being 105.6°, the highest 115° F.

The delirium in some cases was wild, in others muttering.

Pulse.—In eighteen cases the pulse was very rapid and weak, even to being imperceptible, while in the others it was of good force, often bounding but without tension, occasionally slow, but usually accelerated.

Skin.—In all the cases there was a peculiar characteristic pungent odor, and the surface was hot and dry. In those cases with weak and rapid pulse the face was pale, in the others flushed.

Pupils.—Many were pin-point and did not react to light, others being normal in size and reaction.

Respiration varied from normal to stertorous; eleven cases in very bad condition, respired with short gasps.

Muscular System.—There was marked general muscular relaxation in thirteen cases whose circulatory and respiratory system was markedly depressed. Convulsions or muscular twitchings were not present in any case on admission. Involuntary dejections occurred in all the forty-one comatose and semiconscious cases, either before admission or while in the first bath. Vomiting characterized but two cases.

Treatment and Subsequent Course of the Disease.

The ambulance surgeons were instructed to at least start undressing the comatose cases on their way to the hospital. Immediately after admission they were stripped of clothing, which took about thirty seconds. They were then immediately put in the bath, at least one of the house-staff directing the treatment of each case.

All temperatures recorded are rectal, in the conscious cases taken

on admission, and in the comatose as soon as possible after starting the bath.

With the first five cases the netted cot was used, the patient being constantly rubbed and sponged with ice-water. They were all in coma, and the sponging was used, only because the tubs were not in readiness, the cots having been sufficient for the small number of cases treated in previous years.

The average temperature of these cases was 110.3° F., the lowest 105.6° F., the highest 115° F. Thirty-two minutes was the average duration of the bath, varying from fifteen to fifty minutes. The baths were stopped at from 104.5° to 100.6° F., the average temperature of the patients when removed being 101.7° F. Following the bath at an average interval of fifty minutes, ranging from thirty minutes to two hours, the temperatures fell to from 100° to 95° F., the average being 98° F.

The tub-bath was used in thirty-six cases, including all the comatose, delirious, and one conscious case. The water was as cold as it could be kept, with ice constantly floating in it, usually at about 40° F. Four attendants continually rubbed briskly all parts of the body, the head being constantly bathed.

The average temperature of these cases was 108.9° F., the lowest 105° F., the highest 112.2° F. The baths lasted from six to sixty-five minutes, the average being twenty-six. When the temperature reached from 105° to 99.4° F., an average of 103.2° F., they were removed from the bath. At a time averaging forty-eight minutes, and varying from twenty minutes to two hours, the temperature dropped to 97.6° F. as an average, the limits being 93° and 100° F.

Ice sponge-baths were also used in five cases that were conscious or stupid, with moderate temperatures varying from 104° to 105.2° F., and averaging 104.5° F. They were bathed from eight to forty-five minutes, or an average of twenty-three minutes. The temperature at which they were removed was about 102° F., varying from 101° to 103° F., falling to 98.9° F. as an average, but varying from 99.8 to 97° F. about forty-six minutes after being removed from the bath.

In all cases the temperature was taken every five minutes during the early part of the bath, and when it began to drop, as quickly as the thermometer would register. The temperature rose, even after the bath had been started, with five cases, but never over .6° F., usually in about five minutes.

Only eight cases received stimulation by drugs during the bath, and they were cases in which the pulse was almost imperceptible. Camphor and ether were used for rapid action, and then strychnine, all subcutaneously.

The stimulating action of the cold water was remarkable. Cases that were apparently taking their last gasps would immediately respire more deeply, and a pulse almost impossible to feel would, in the course of a few minutes, be of good quality, though rapid.

Those in coma would, when the temperature began falling, as a rule, rouse up, struggle, and become more or less delirious.

Those delirious would resist the bath vigorously, then grow more quiet, and again become restless as the temperature fell more.

On removing the patients from the bath, they were rubbed dry with crash towels, covered with a blanket, and hot-water bottles placed at their feet.

If their condition indicated it, either from pulse, respiration, or any considerable falling of the temperature, they were further stimulated with camphor and ether, strychnine, digitaline, or atropine, hypodermatically, and with whiskey and hot water by rectum, or, when possible, by mouth.

The early regaining of consciousness seemed a particularly good prognostic sign, all such cases (except Case 10) doing remarkably well. Of these cases there were twenty-six, and they were rational, on an average, twenty-four minutes after leaving the bath, the shortest interval being five minutes, the longest two hours. With two exceptions (Cases 10 and 36) the fatal cases never regained consciousness, and those that were critically ill after the baths did not regain consciousness for hours, and, in some cases, days.

After the lowest temperature following the bath had been reached, there was more or less of a reactionary elevation, in some cases needing no treatment, in others nothing but one or more sponge-baths at 70° to 75° F. Some of these second elevations of temperature were very alarming, and demanded very prompt and active treatment.

The ice-water enemata, as first suggested by Parkes, were not used, owing to the difficulty in following the changes of temperature closely enough, and because the ice-sponge, or, in the worst cases, the ice tub-baths acted quickly, and were stimulating (due to rubbing) rather than depressing.

The most severe and sudden second rises were usually announced, even before the thermometer indicated it by fibrillary twitchings, becoming more and more marked, until they closely resembled epileptic or uræmic general convulsions. They were usually preceded and accompanied by a wild delirium, which subsided as the temperature advanced. This rise was extremely rapid, and frequently advanced after beginning the bath. In all there were seven cases with severe convulsions, of whom six received second ice tub-baths, which were started as soon as possible after the beginning of muscular twitchings, so as to anticipate the high temperature which was sure to follow. Thus the highest temperature reached was 106° F., one not going above 103.8° F., the average being 104.9° F. at an average period of two and a half hours from the lowest temperature obtained by the first bath.

Of the six cases, two died, never having become conscious. The other four had not regained consciousness after the first bath, but in a short time after the second were perfectly rational, acting as the twenty-six cases above mentioned. Three cases needed no subsequent sponge-bathing.

For the convulsions mentioned, morphine was used, but with apparently no effect.

It was made the routine practice to take all temperatures every half hour until danger of sudden rise had passed. Whenever a temperature reached 102.5° F., or, in some cases, 103° F., the patient was sponged, usually with water at 70° F., but if the temperature had risen rapidly, with ice-water. These baths lasted from ten to fifteen minutes, or, in some cases, until the temperature was reduced to 101° F.

Subsequent Baths.—Twenty cases recovered with no baths other than the initial one. Two died without the temperature rising again. Three of the six cases with convulsions, above mentioned, had one second tub-bath. The remaining twenty-five, of whom two already had had a second ice-tub, had sponge-baths ; nine had one ; seven had two ; two had three ; three had four ; one each had seven, eight, sixteen, and twenty-two.

After the temperature had thus been controlled, the patients, with few exceptions, recovered uneventfully.

Urine, for the first twelve to twenty-four hours, was, in all cases, voided normally, was not decreased in quantity, averaged a specific

gravity of 1,020, almost always contained a trace of albumin, but seldom casts.

Mental Condition.—Except in alcoholic cases, a quiet sleep was the rule. The mind was clear, no headache, but considerable headache when they first got up.

Skin.—In all cases that had received ice-baths the entire surface was covered with minute petechiæ. The skin remained dry in many instances, but after administering Dover's powder, with hot lemonade, sweating became normal. Four cases developed troublesome furunculosis from direct infection from foul water in which they were bathed, due to involuntary dejections.

Mucous Membranes.—During and after the tub-baths there was bloody expectoration in about ten cases, apparently due to intense congestion, which must have existed through all mucous surfaces, as four cases had blood-stained stools, and one case considerable blood with vomitus.

Time in Hospital.—Excluding nine fatal and nine complicated cases, there were thirty-two that left the hospital at the end of thirty hours, as an average, varying from eight to seventy-two hours.

THE FATAL CASES.

Autopsies were made in five of the following nine cases, by Dr. Geo. A. Tuttle.

Case 2. C. S., male; aged forty-nine; carpenter; German; admitted August 8. Moderate alcoholic habit. Had been at work in his shop all day, and was about to start home when he suddenly became unconscious.

Brought to hospital at 7.15 P.M. comatose, face flushed, surface hot and dry, breathing stertorous, pulse rapid and rather weak. Immediately undressed, and ice sponge-bath started. First temperature taken was 112° F. At the end of forty-five minutes temperature had fallen to 101° F., and he was removed to a dry cot. The temperature continued to drop rapidly, calling for vigorous stimulation. Two hours after bath, temperature reached 95° F., he became delirious, pulse rapid and weak. Camphor and ether, strychnine and whiskey given hypodermically and whiskey and hot water by rectum. For delirium, Magendie's solution, minims v., and hyoscin, gr. $\frac{1}{100}$. There was some vomiting. The pulse improved,

the temperature rose, and by 1.30 A.M., August 9 had reached 105° F. He was sponged thirty minutes with water at 75° F. with but little effect on the temperature. Delirium had given place to coma, in which he remained. Sponge-baths were given at 5.30 A.M. for temperature of 104.8° F. for thirty minutes, with reduction to 102° F. At 8.30 A.M. took four ounces of milk. Another bath at this time reduced temperature from 104° to 102° F. At about noon there began some muscular twitchings that were general. Coma deepened. At 2.15 P.M., with temperature 104.4° F., there was a sudden general tonic spasm, and patient died, nineteen hours after admission.

Autopsy.—August 10. Twenty-four hours post-mortem.

Heart.—Aortic and mitral valves a little thickened; endocardium stained and dark; muscle flabby. *Lungs.*—Considerable congestion and œdema. *Liver and Spleen.*—Normal. *Pancreas.*—Soft and blood-stained. *Kidneys.*—Section rather pale; markings indistinct in cortex. Little stained by decomposition. *Brain.*—Rather soft; otherwise normal.

Case 4. M. McG., male; aged twenty-four; seaman; Irish. Previous history not obtainable. Admitted August 9, at 3.55 P.M. Coma, face pale, skin hot and dry; pulse almost imperceptible, breathing rapid and shallow; general muscular relaxation. Immediately given ice sponge-bath, with general friction. First temperature, 112° F. Given one drachm of camphor and ether hypodermically; sulphate of strychnine, gr. $\frac{1}{20}$, hypodermically. General condition improved during bath. At the end of fifty minutes the bath was stopped at 101.2° F. Rubbed dry. Heat was applied to feet, and two ounces of whiskey was given and eight ounces of hot water by rectum. At 7.30 another ice sponge-bath for temperature 105° F., which dropped in ten minutes to 101.3° F. A similar bath at 9.45 P.M. for temperature 104.4° F., temperature reaching 99° F. at 11 P.M. Coma persisted. More such stimulation as was given before, with no response. Still in coma. At 12.20 A.M., August 10, a general convulsion, lasting three minutes. Following this the pulse became imperceptible, and he died at 12.35 A.M.

Autopsy.—August 11. Fourteen hours post-mortem.

Heart.—Endocardium blood-stained. Muscle flabby. *Lungs.*—Extreme congestion, most marked in lower lobe. *Liver.*—Section brown and stained. *Spleen and Pancreas.*—Normal. *Kidney.*—Section congested. *Brain.*—Appears soft about fourth ventricle,

elsewhere normal. *Cord.*—A little softened; vessels of pia much congested.

Case 7. A. K., male. Nothing known of him.

Admitted at 5.48 P.M., August 10. Markedly alcoholic; coma; surface hot and dry, face flushed, pulse small and rapid. Immediately put in ice tub-bath. First temperature, 109° F. Within five minutes there was a general tonic spasm, jaws firmly set, and he began vomiting large quantities of fluid containing alcohol. Jaws were quickly pried apart and the pharynx swabbed out, but already the trachea and bronchi were full of vomitus. The O'Dwyer forced respiration apparatus was immediately put in the larynx, but with every stroke of the bellows, instead of the lungs expanding, large quantities of vomitus were forced out along the side of the tube. The patient died seven minutes after admission.

No autopsy.

Case 10. T. P., male; aged seventy. Admitted August 10, at 11.40 A.M. The previous day had an attack of insolation, for which he was treated at Roosevelt Hospital, and left there the morning of the present attack. On admission, semi-conscious and delirious, face pale, skin hot and dry, breathing stertorous, pulse rapid and weak, temperature, 108° F. Ice-sponge started, but soon changed to ice-tub. Bath stopped at the end of thirty-five minutes, when temperature had reached 103.8° F. A little over one hour later it had dropped to 93° F. Pulse weak; general cyanosis. He responded well to stimulation by means of whiskey and hot water by mouth and rectum, and by hypodermic injections of camphor and ether and strychnine. At 8 P.M. temperature had reached 104° F. Color good, pulse strong and perfectly rational. A sponge-bath of ice-water reduced the temperature to 100° F., and he continued to improve. The temperature ran fairly high, and until the morning of August 12 he had had in all seven sponge-baths, with good reactions, the temperature reaching about normal after each bath. He now began to have a marked bronchitis, and the temperature again rose to 103° F. Another bath was given, of the usual duration, but following it the temperature reached 94.5° F. This seemed to be too much for his already exhausted condition. The pulse became rapid and weak, there was marked cyanosis, breathing rapid and shallow, and some delirium. There were signs of œdema of both lungs. The temperature rose to 104.2° F., when he died at 8.20

P.M., August 12, sixty hours after admission. There was no autopsy.

Case 11. J. M., male; aged twenty-five. Admitted August 10, at 12.25 P.M. Comatose; face rather pale; skin hot and dry; pulse rapid and weak; respirations shallow. Immediately put in ice tub-bath. Temperature, 110.2° F., which rose in five minutes to 110.4° F. After the temperature began to fall he became very delirious. When the temperature reached 103° F., fifty minutes after beginning the bath, he was removed. In about two hours the temperature had reached 97° F., but he still remained unconscious. At 2 P.M. he was removed to the main ward, when almost immediately he began having some muscular twitchings and wild delirium. In fifteen minutes his temperature rose from 100° to 103° F., and in another fifteen minutes to 107° F. On account of the crowding in the Insolation Ward he could not be removed there and given another tub-bath, so the ice-sponge was used. Five minutes after beginning it the temperature rose from 107° to 108.9° F., and then began to fall, reaching 102° F. one hour later, when the bath was stopped, after which it fell to 98° F. In the light of later cases a more rapid drop would have been more favorable, as it almost immediately began rising again, accompanied by the same delirium and terrific general convulsions, which morphine did not affect. Before another bath could be given the convulsions became more and more severe, the temperature suddenly rose to 105° F., and the patient died.

Autopsy.—Large frame, finely muscled.

Heart.—Some ecchymotic spots beneath endocardium of left ventricle. Otherwise normal. *Lungs.*—Marked congestion throughout. *Liver and Pancreas.*—Normal. *Spleen.*—Capsule thickened on outer surface. *Kidneys.*—Capsule adherent; surface roughened; section apparently normal. *Brain.*—A few small congested spots in pia mater, with extravasation of blood beneath; tissue everywhere quite firm. *Cord.*—Upper half seems a little softer than lower part; otherwise appears normal.

Case 12. M. H., male; aged forty-five; laborer. Admitted August 10, at 1.10 P.M. While at work was suddenly seized with dizziness, and fell. When brought to the hospital was in coma; face rather pale; skin dry and hot; pulse rapid and weak; breathing shallow; all muscles relaxed, and had a temperature of 110.2° F. Immediately put in ice tub-bath and vigorously rubbed. At the

end of twenty-five minutes the temperature had reached 103.4° F., and he was removed, rubbed dry with crash towels, blanketed, and hot water put at the feet. Pulse remained, so he was stimulated with camphor and ether, one ounce, and strychnine sulphate, gr. $\frac{1}{30}$, hypodermically. By 2.15 P.M. the temperature had dropped to 94.5° F. Still unconscious, pulse weak, and breathing shallow. Whiskey and hot water were given by rectum, and more hypodermic stimulation, but he did not respond. At 3 P.M. there was general muscular rigidity. Though his temperature rose, he became rapidly worse, and at 4 P.M. died, with a temperature of 102.6° F.

Owing to the rapidity with which new cases kept coming in, no careful physical examination had been made.

Autopsy.—August 11. Twenty-four hours post-mortem.

Heart.—Pericardium everywhere adherent. Valves normal. Muscle flabby. *Lungs.*—Moderate congestion and œdema. *Liver.*—Soft; surface pale; section pale and flabby. *Spleen and Pancreas.*—Normal. *Kidneys.*—Capsule somewhat adherent; surface rough and uneven; section cortex thin and pale; markings, indistinct. *Brain.*—Appears normal.

Case 27. J. H., male; aged thirty-two. Admitted August 11, at 3.10 P.M. Large frame, magnificently muscled. Comatose; face flushed; skin hot and dry; pulse rapid and weak; breathing stertorous. Immediately put in ice tub-bath and rubbed well for twenty-six minutes, when temperature had reached 103.5° F., and bath was discontinued. Later the temperature reached 97.4° F., though he had not regained consciousness. About 8 P.M. the temperature began to rise, and he had slight muscular twitchings of the face, which became rapidly more general. At 8.35 P.M., with a temperature of 102.6° F., a second ice tub-bath was started, in spite of which the temperature continued to rise for ten minutes, when it had reached 105° F. The next registration was 104.8° F. It was thought best to wait for another drop, but the thermometer again showed 104.8° F. Supposing that there was a mistake in taking the temperature, it was tried again, and for the third time registered 104.8° F., though from his general appearance it seemed that there must have been a drop. A new thermometer was used, which showed 98.6° F. Of course the bath was stopped immediately, he was vigorously rubbed, heavily blanketed, and surrounded with hot-water bottles. Stimulation in every possible form was used, cam-

phor and ether, strychnine, digitaline, and whiskey hypodermically, and enemata of hot water and whiskey. Notwithstanding this, at the end of an hour the temperature was but 94° F. and the patient in very bad condition. In another hour the temperature had risen to 99.9° F., but he died a few minutes later.

This case was particularly regrettable, as, in the light of several similar cases that recovered, it seemed probable that death was due to the prolonged bath, caused by a false-registering thermometer, probably made so by being cracked against a piece of ice floating about the tub.

Case 36. E. S., male; aged forty-seven; wood-carver; German. Admitted August 11, at 7.15 P.M. Comatose; face pale; skin hot and dry; pulse almost imperceptible; breathing slow; very shallow. All muscles very much relaxed. Pupils did not react to light. In worse condition on admission than any of the other cases. He was expected to die momentarily. Immediately put in ice tub-bath, when first temperature taken was 109.5° F. In twenty minutes temperature was 104° F. and bath stopped. Stimulated vigorously with little response. Forty minutes after the bath the temperature was 99.8° F., and then rose to 102° F. when he had a sponge-bath. Still in coma; marked cyanosis; breathing stertorous; pulse barely felt. There was some vomiting. He was then bled, eight ounces being taken. After this he responded better to stimulation, the temperature rising to 104.2° F. A second ice tub-bath was given at 11.35 P.M., after which temperature reached 99.1° F. Hot normal salt solution (one pint) was given by rectum, and other stimulation hypodermically.

During the next day, the twelfth, two sponge-baths of ice-water were given, and the general condition was improved, though coma persisted. On August 13 patient could be slightly aroused; pulse good force; only slight cyanosis; pupils and tendon reflexes normal. Saline enemata and digitaline and strychnine were continued. During the day six sponge-baths were given, being ordered whenever the temperature reached 103° F.

On the fourth day patient could be aroused enough to answer questions, though usually apathetic and stupid. There was some flatness of left side of face, ptosis of right eye, marked muscular weakness of right side of trunk, respiratory movements being almost entirely confined to left side. Abdominal and thoracic, viscera

normal but for signs of congestion at the base of each lung. But one bath during day.

During the fifth, sixth, and seventh day the conditions remained about the same. Mentally, he improved. The congestion of the lungs increased. But one bath was necessary each day. On the eighth day he began coughing severely, pulse irregular and rapid, breathing labored. Over the base of each lung posteriorly scattered areas of broncho-vesicular voice and breathing could be made out, and fine crepitant and sub-crepitant râles were abundant. The muscular weakness had become less marked on the right side.

The entire chest was cupped and poulticed. Digitalis and nitroglycerine given. On the ninth day the patient became worse, respirations of about fifty, extremities cyanosed, almost unconscious. Was bathed for a temperature of 104.5° F.; seemed a little improved for it, but then lapsed back to his former condition and began having convulsive movements of all extremities, which continued to death, which occurred at 2.30 P.M. of the ninth day.

Autopsy.—August 20. Eight hours post-mortem.

Heart.—Mitral valve thickened, otherwise normal. *Lungs.*—Marked congestion. *Gall-bladder.*—Contains a calculus 1 × ¾ inch. *Liver and Pancreas.*—Normal. *Spleen.*—Soft. *Kidneys.*—Several small cysts; cortex a little opaque; some congestion. *Brain.*—Pia congested; slight ecchymosis beneath; pia a little opaque and rough in places; brain-tissue firm and apparently normal; a little blood-stained serum in ventricles.

The case is interesting because of the length of life, when his condition on admission is considered; the benefit of bleeding; the change for the worse, without assignable cause, when he seemed improving; the fact of no broncho-pneumonia being found at autopsy, when the signs, symptoms, and death indicated its presence; the meningeal symptoms and their minor lesions found at autopsy.

Case 37. J. T., male; aged fifty-four. Admitted August 11, at 7.04 P.M. General condition practically the same as that of Case 36. Temperature, 111° F. Immediately put in ice tub-bath, during which he was freely stimulated. Only slightly improved by bath, which was stopped in thirty-six minutes, when the temperature was 103° F. Following this, temperature reached 98° F. At intervals of an hour and two hours sponge-baths had to be given, the temperature having reached 104° F. After the second the temperature

fell to 95° F., and then rose to 100.5° F. at 2.50 A.M. of the following day, when he died, never having regained consciousness.

OTHER CASES OF CONSIDERABLE INTEREST.

Case 3. M. S., aged forty-seven; bartender; German. Admitted August 9, at 9.55 A.M. The attack began with no premonition, save that he was very tired from great loss of sleep. There was a marked alcoholic history. On admission he was in coma, face flushed, pulse very weak and rapid, breathing shallow, muscles relaxed. The temperature was 115° F., the highest ever recorded in the Presbyterian Hospital. Immediately put on netted cot and the ice sponge-bath used for thirty-three minutes, when temperature was 104.5° F. He was stimulated with strychnine, digitaline, and whiskey, and sent to the main ward at 10.45 A.M., with a temperature of 99.5° F. His general condition was greatly improved, but coma persisted. In the next nine hours four ice sponge-baths were necessary to keep the temperature below 104° F.

The second day coma still existed, there was rigidity and increased tendon reflexes of the extremities; pupils and viscera appeared normal. Four sponge-baths given. On the third day he was semi-conscious, answered questions, marked vertical nystagmus, some rigidity of muscles of back of neck. Surface covered with petechiæ. Great difficulty in swallowing. Pulse rapid and weak. Five baths given. The fourth day, symptoms of cerebral congestion persisting, nine and a half ounces of blood were taken by venesection, and a pint of hot normal salt solution given by rectum. All other stimulation stopped. The temperature ranged fairly high, and four sponge-baths at 70° F. were necessary. The urine was involuntary, of a specific gravity of 1,020, trace of albumin, and a few granular casts.

By the fifth day he was better, the bleeding apparently having been of benefit. Still stupid, with considerable rolling of the head from side to side. The head was shaved, an ice-cap applied, and small blisters applied over each mastoid region. Three baths were given, and he seemed brighter.

From this time on improvement was slow but constant. Took nourishment well, talked intelligently, reflexes normal. The last of the twenty-two baths that he received was given on the sixth day.

On the sixteenth day he sat up in bed. By the twenty-first day he was out of bed. When first attempting to walk, on the thirty-first day, there was marked muscular incoördination, making the gait very unsteady, and affecting upper extremities as well. Weighed 115 pounds.

On the forty-third day had gained five pounds. Still there was present some incoördination, and there remained a somewhat weakened mental condition. He left the hospital on the forty-fourth day.

The case was remarkable in recovering from such a high temperature, accompanied by such severe and persistent meningeal symptoms.

Case 8. A. N., aged forty-two; cigar-maker; Bohemian. Admitted August 9, at 9.35 P.M. A large frame, very obese, weighing about two hundred and fifty pounds. On admission was in coma, face flushed, pulse full and bounding, breathing stertorous. Was interesting chiefly because in the ice-tub it took seventy minutes to reduce the temperature from 110° to 102° F. Four subsequent baths given, each a sponge-bath, and with good reaction. His mental condition cleared up slowly, not being rational until twelve hours after the bath. For two days there was considerable vomiting, vomitus containing blood. There was also some bleeding from mouth and rectum.

Later he had a troublesome furunculosis, apparently due to direct infection from the water of the bath, made innocuous by involuntary dejections. The same thing occurred in several other cases. He left the hospital on the eleventh day.

Case 45. J. M., aged thirty-five; brewery driver. Admitted August 12, at 8.13 P.M. There was a marked alcoholic habit. His was an average case, the temperature being 108° F. The initial ice tub-bath was all that was necessary to control the temperature. Shortly after the bath he became perfectly conscious, slept well, and the temperature remained down. There was, however, a fine alcoholic tremor of tongue and fingers. On the third day he insisted upon going out.

On the day following he was brought back, having violent delirium tremens, the only case thus complicated.

It was necessary to strap him in bed. Good-sized doses of strychnine made it possible to use chloral, the bromides, morphine,

and hyoscine, freely. Under this treatment the delirium subsided in forty-eight hours, and he left the hospital thirteen days after the onset of the delirium tremens.

Case 13. J. C., male; aged thirty-six. Admitted August 10.

Case 20. J. G., male; aged thirty-one. Admitted August 11.

Case 32. S. M., female; aged nineteen. Admitted August 11.

These three cases resembled each other closely. In them the good results obtained from the ice tub-bath, in the grave second rise of temperature, make Cases 11 and 27 particularly regrettable.

Their temperatures on admission were 112°, 109.5°, and 110° F., respectively. After the initial bath the temperature of each approached the normal line closely, none being sub-normal. None of them, however, regained consciousness. At a time varying from one to three hours there began in each the severe muscular twitchings indicative of a sharp second rise of temperature. As soon as possible, not waiting for the high temperature, the second ice tub-bath was started. Even with it, the second temperatures reached 105.4°, 105.9°, and 103.8° F., respectively. After the bath two dropped to normal, Case 13 reaching 95° F. Within half an hour each patient was perfectly rational, and made an uneventful recovery, leaving the hospital on their third, third, and fourth days, respectively.

The severity of the epidemic, the large number of cases occurring in so short a time, and the crowding consequent to such an emergency, makes the low death-rate of nine in sixty-one cases (eleven not tabulated), or fourteen and three-quarter per cent., extremely gratifying.

In this hospital, from August, 1888, to April, 1896, there were twenty-two cases of insolation having temperatures corresponding to the arbitrary standards adopted above, with nine deaths, a mortality of forty-one per cent. At the Pennsylvania Hospital, in the summer of 1887, there were thirty-one cases, with twelve deaths, a mortality of thirty-eight per cent. A report by Swift of one hundred and fifty cases records seventy-eight deaths, a mortality of fifty-two per cent.

A comparison of these records shows the importance of noting, if possible, any points in the treatment of cases in the epidemic of the past summer, which could in any way account for the marked difference in mortality.

Hydrotherapy and skilled and careful nursing seem to have been the chief factors; the very frequent recording of the temperature, enabling the baths to be given at the earliest and, therefore, most valuable time; the use of the ice tub-bath, with constant and general friction of the entire surface, thus reducing the temperature in the shortest possible time and being stimulating rather than depressing; the use of the same bath for all severe secondary elevations of temperature, and for the minor elevations sponge-baths of ice-water or of water at from 70° to 80° F., depending upon the individual case; and the repetition of these baths whenever the temperature is high enough to make them seem advisable.

All other means have seemed entirely inadequate.

XXII.

FORCED RESPIRATION IN A CASE OF CARBOLIC-ACID POISONING.

By N. R. Norton, M.D.,

HOUSE PHYSICIAN.

M. D., aged forty-one ; female ; was admitted April 29, 1896, to the service of Dr. Walter B. James, through whose kindness the case is reported. About half an hour before admission she had taken an unknown but considerable quantity of ninety-five per cent. carbolic acid, with suicidal intent.

When found by the ambulance surgeon she was unconscious, face and extremities markedly cyanosed, frothy fluid coming from the mouth, breathing slow, pulse rapid but bounding, tracheal rattle, and marked œdema of lungs.

On admission to the emergency ward the condition was unchanged. There were marks of carbolic acid in the mouth and upon the chin. The pupils were contracted. Respirations about eight to the minute and very labored. The tracheal rattle and œdema of the lungs persisted. The breathing was that of laryngeal stenosis, apparently due to œdema of the glottis, and a central depression of respiration. The face and extremities were very cyanotic, but the pulse was regular, full, and bounding.

Within two minutes the pulse quickly became rapid, thready, and irregular. The respirations became shallow and gasping, and there was every indication that the patient would live but a few minutes.

As the immediate indication was to relieve the laryngeal and pulmonary condition, an attempt was made to pass the laryngeal tube of Dr. O'Dwyer's forced-respiration apparatus. The first

tube used was found to be too large, and while it was being changed Sylvester's artificial respiration was practised, with inhalations of amyl-nitrite. At this time natural respirations had practically stopped. The laryngeal tube was now readily introduced, and forced respirations, of about twelve to the minute, were begun.

She responded immediately. At the end of five minutes the cyanosis had entirely disappeared, and the pulse became full, strong, and about ninety.

The stomach-tube was now passed, the laryngeal tube being left *in situ*. The gastric contents had a strong odor of carbolic acid. The stomach was thoroughly washed, the last washing was with a solution of magnesium sulphate, some being left in after the removal of the œsophageal tube.

During this time forced respiration had been continued. The reflexes began to return and there were attempts at coughing, causing the escape of considerable quantities of frothy fluid through and around the tube. At the expiration of fifteen minutes the condition was improved enough to warrant the withdrawal of the tube. She was then given sulphate of strychnine, gr. $\frac{1}{30}$, sulphate of atropine, gr. $\frac{1}{75}$, subcutaneously, and a stimulating enema of whiskey and hot water.

During the next few hours she expectorated about one pint of frothy fluid. The pulse became full, with some tension, for which nitro-glycerine, gr. $\frac{1}{100}$, was exhibited every hour.

On the second day apathy still remained. Twelve ounces of smoky urine was passed normally, with a specific gravity of 1,028, containing a trace of albumin, but no casts or blood, and giving the reaction for carbolic acid.

Throughout both lungs many bubbling râles could be heard. Pulse still irregular, and with some tension. The third day the temperature reached its highest point, 103° F. The patient was perfectly rational, breathing normal, voice husky, and slight cough.

From this time on the temperature gradually declined, pulse lost its tension and became regular, the signs in the lungs cleared up, she passed an average amount of thirty ounces of urine for twenty-four hours, and left the hospital on the eighth day.

The case has seemed of interest chiefly for the quick relief afforded by Dr. O'Dwyer's forced-respiration apparatus, in a condition which, without it, would undoubtedly have caused death. As far as can be learned, it is the only case in which it has been used for this purpose with success.

XXIII.

A TABLE OF SEVENTEEN CONSECUTIVE NEPHRECTOMIES.

PREPARED BY FORBES HAWKES, M.D.,

SURGICAL REGISTRAR.

Since the opening of the new operating pavilion of the Presbyterian Hospital, in the summer of 1893, seventeen consecutive nephrectomies have been done without a death.

Appended is a brief table of these cases :

Name.	Sex.	Age.	Admitted.	Discharged.	Nature of Disease.	Mode of Operation.	Operator.	Result.
G. P.	M.	49	Dec. 22, '93.	Oct. 10, '94.	Renal calculus.	Posterior lumbar route, vertical incision outer border erector spinæ muscle.	Dr. C. K. Briddon.	Recovery.
S. A.	M.	40	Jan. 23, '94.	May 31, '94.	Pyelonephritis.	Lateral lumbar route, retroperitoneal removal.	Dr. A. J. McCosh.	Recovery.
M. D.	F.	29	Feb. 5, '94.	April 12, '94.	Tubercular kidney.	Posterior lumbar route, vertical incision outer border erector spinæ muscle.	Dr. C. K. Briddon.	Recovery.
K. F.	F.	25	May 15, '94.	Aug. 8, '94.	Suppurating kidney.	Lateral lumbar route, retroperitoneal removal.	Dr. A. J. McCosh.	Recovery.
J. D.	F.	33	June 20, 94.	Nov. 26, '94.	Tubercular kidney.	Posterior lumbar route, vertical incision outer border erector spinæ muscle.	Dr. E. Eliot, Jr.	Recovery.
A. R.	F.	52	Sept. 14, '94	Dec. 21, '94	Pyelonephritis.	Posterior lumbar route.	Dr. C. K. Briddon.	Recovery.
J. J.	F.	24	Aug. 17, '95.	Sept. 20, '95.	Pyelitis, congestion of kidney.	Posterior and lateral lumbar route.	Dr. E. Eliot, Jr.	Recovery.
A. B.	F.	29	Oct. 25, '95.	Dec. 31, '95.	Tubercular kidney.	Lateral lumbar route, retroperitoneal removal.	Dr. A. J. McCosh.	Recovery.
W. K.	M.	31	Oct. 30. '95.	Dec. 3, '95.	Hydronephrosis.	Lateral lumbar route, retroperitoneal removal.	Dr. A. J. McCosh.	Recovery.
M. H.	F.	32	Dec. 27, '95.	June 11, '96,	Tubercular kidney.	Lateral and posterior lumbar route, retroperitoneal removal.	Dr. A. J. McCosh.	Recovery.
E. T.	F.	56	Jan. 27, '96.	April 26, '96.	Parenchymatous nephritis, the result of previous operations.	Lateral lumbar route, retroperitoneal removal through old scar.	Dr. A. J. McCosh.	Recovery.
J. H.	F.	27	Mar. 20, '96.	April 13, '96.	Pyelitis.	Lateral lumbar route, retroperitoneal removal.	Dr. Ch. McBurney.	Recovery.
M. S.	F.	29	May 24, '96.	July 13, '96.	Tubercular kidney.	Posterior lumbar route, vertical incision outer border erector spinæ muscle.	Dr. C. K. Briddon.	Recovery.
W. C.	M.	14	Aug. 28, '96.	Oct. 10, '96.	Tubercular kidney.	Lateral lumbar route, retroperitoneal removal.	Dr. F. Tilden Brown.	Recovery.
S. R.	M.	48	Oct. 28, '96.	Convalescent in hospital ward.	Pyelonephritis.	Lateral lumbar route, retroperitoneal removal.	Dr. A. J. McCosh.	Recovery.
M. S.	F.	32	Nov. 18, '96.	Convalescent in hospital ward.	Pyelitis.	Lateral lumbar route, retroperitoneal removal.	Dr. A. J. McCosh.	Recovery.
M. W.	F.	33	Dec. 3, '96.	Convalescent in hospital ward.	Tubercular kidney.	Lateral lumbar route, retroperitoneal removal.	Dr. A. J. McCosh.	Recovery.

XXIV.

THE OPERATING-PAVILION.

By Andrew J. McCosh, M.D.

(*Photographs by Dr. Charles W. Stevens.*)

The operating-pavilion was completed nearly four years ago, and since then has been in constant use, scarcely a day having passed when one or more operations have not been performed within its walls, so that the aggregate amounts to thirty-five hundred. An ample opportunity has thus been afforded to test the efficiency of the building and for the formation of a judgment as to its fulfilment of the purposes for which it was erected. These purposes are two in number. The first is, that it should afford accessible, commodious, well-lighted, and clean rooms for all operations which occur in the service of a general hospital of three hundred and thirty beds, and where two or more surgeons are simultaneously on duty. The second is, that in one of these operating-rooms there should be comfortable accommodation for an audience of ninety persons, and that the seats should be so arranged that each spectator could enjoy an unobstructed view of the operating-table. In both these respects the building is all that could have been desired, and with a few minor exceptions I do not see how a pavilion could have been built which would better serve the requirements of the hospital.

The pavilion is a separate building of pressed brick, two stories in height, with a cellar.* It occupies an area of 51 × 51 feet. It is connected with the hospital-wards by a steam-heated, amply lighted, covered corridor, 55 feet in length and 8 feet in width (shown in part in Fig. 1).

The patient is transferred from the wards (or private rooms) in a stretcher-carriage, which enters the elevator and so descends to the

* For the plans of the building and of the seats, and for other information, I am indebted to the architects, Messrs. Cady, Berg, & See.

corridor, along which it is wheeled until the operating-pavilion is reached, when it either passes with the patient into the lower anæsthetizing-room or enters another elevator and ascends to the anæsthetizing-room on the second floor.

The cellar is smoothly finished, is dry, light, and airy. In it are two small rooms, which are used by the photographer, and a large sterilizer, in which are sterilized the operating-suits of surgeons and nurses.

All of the rooms were built in anticipation of the free use of the hose, which can be employed without damage in all parts of the building. The plaster-work is of "hard finish," with four coats of

FIG. 1.—Ground Plan of First Floor.

Cady, Berg & See, Architects.

oil-paint. The doors, bases, wainscots, etc., are of Tennessee marble. The floors are of mosaic, the blocks one inch square. Those *under* the operating-tables are very carefully squared and fitted, and are of dark Tennessee marble. The iron-work is finished in hard white enamel. The doors of all the operating-rooms are of marble, two inches thick, hung in bronze fittings, which move very easily. It may be of interest to certain critics to state that these doors are in every respect satisfactory, indeed more so than would be wooden doors. Not a single one has been out of order since the pavilion has been in use. Wood has been absolutely excluded from the operating-rooms and is very sparingly used in the other parts of the

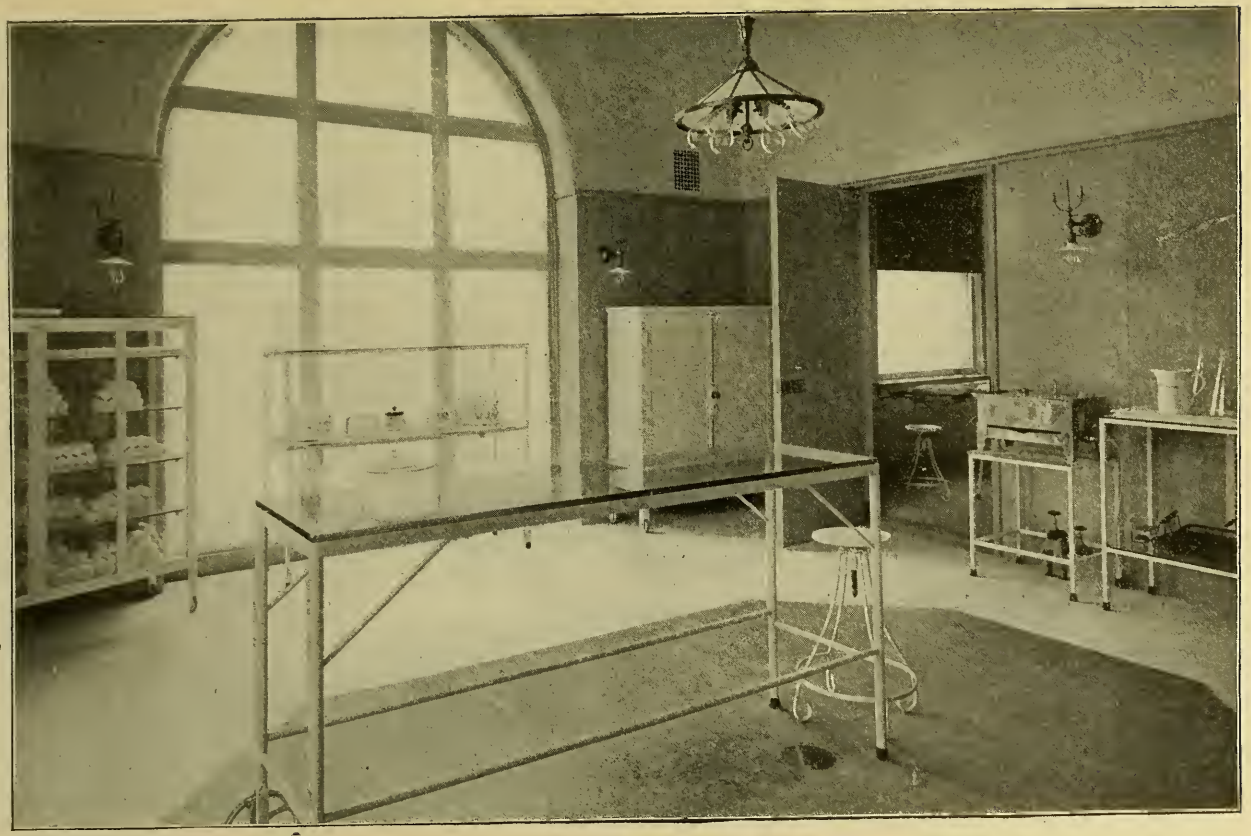


FIG. 2.—Operating Room A.

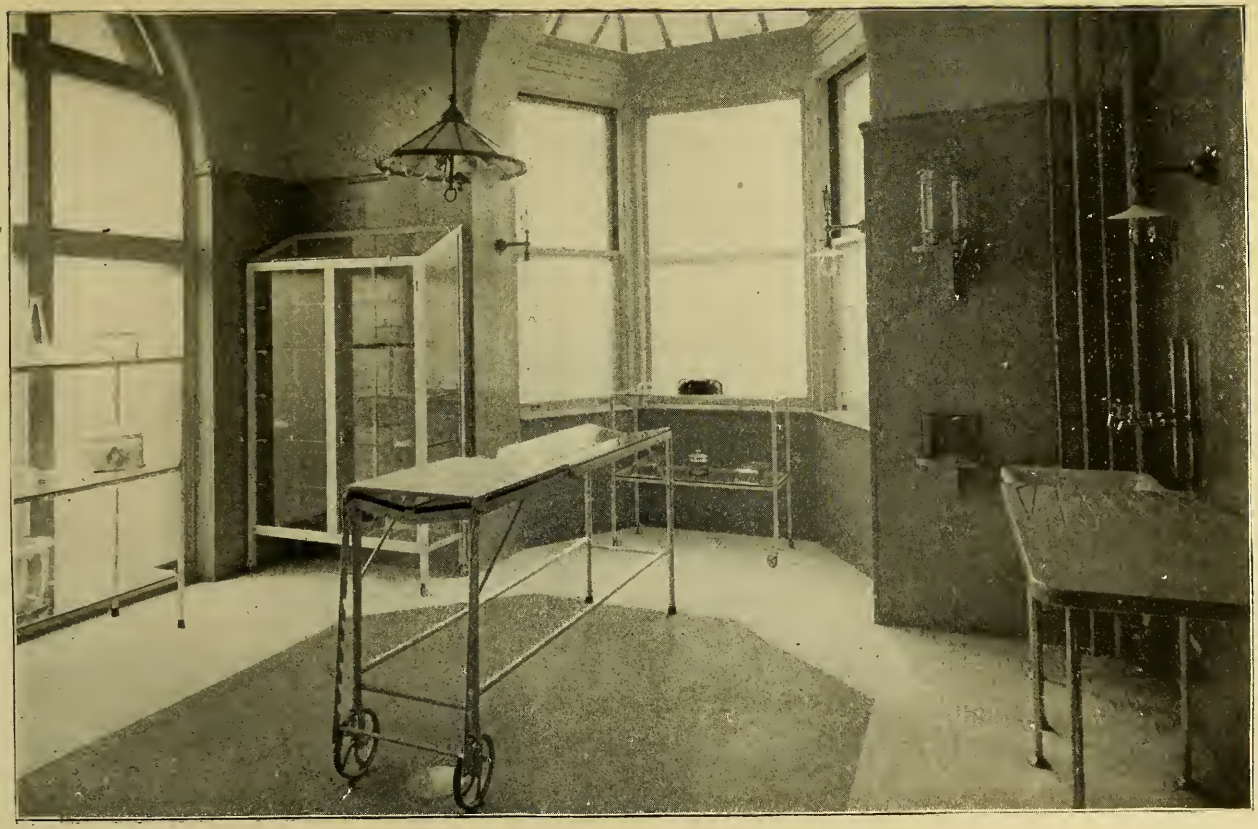


FIG. 3.—Operating Room B.

building. All places where dust or dampness might collect have been carefully eliminated, and the fittings everywhere so devised as to be readily cleaned.

FIRST STORY.

This might be called the basement. It contains two medium-sized operating-rooms, with an anæsthetizing-room, one wash and dressing-room, two "recovery-rooms," and a nurses' supply-room.

Anæsthetizing-room.—This is situated between the two operating-rooms, into each of which it opens through a broad door, which is kept closed until the patient is fully under the influence of the anæsthetic. In addition to the stretcher-carriage on which the patient is anæsthetized, it contains, in one corner, a triangular cabinet of glass and iron, in which are kept anæsthetic and restorative agents, inhalers, etc. A glimpse into this room is given through the open door in Fig 2, showing the end of the stretcher-carriage with the stool for the anæsthetizer.

Operating-room A.—This is shown on the lower left-hand corner of Fig. 1, and in Fig. 2. Originally this room was designed for septic cases. Such a division, however, has been abandoned, and it is now used for an occasional night operation, or when the main theatre is already occupied. It is lighted by two large windows, nine feet wide, extending from floor to ceiling. One of these is shown in Fig. 2, the other faces the end of the operating-table. The door which stands open leads into the anæsthetizing-room. Behind it is seen an iron cupboard which contains rubber sheets, sand-bags, etc. Then comes the window, in front of which is an open stand consisting of three glass plates on an iron frame. On this are kept, in proper receptacles, sterilized sutures, rubber tissue, gauzes, etc. Following to the left there is seen in the corner a glass and iron cabinet, one-half of which is devoted to instruments and the other to bandages. Then comes the other window, in front of which are two small glass tables, and then the door which leads into the wash-room. The remainder of the wall-space is occupied by a sink with a large marble drain-slab for washing instruments, etc. Beyond this is a door leading into the hall, and between the two doors can be seen the instrument-stand and instrument-sterilizer. In the centre of the room stands the operating-table, a glass plate three-quarters

of an inch thick, 74 inches long, 20 inches wide, and 39 inches high, which rests on a perfectly simple iron frame.

Operating-room B.—This room was designed for special cases or emergencies. It is lighted by two large windows, one of which is seen to the left, and the other, which is a bay-window with a dome-light above, faces the anæsthetizing-room. The furnishing is similar to that in Room A, except the operating-table, which is a duplicate

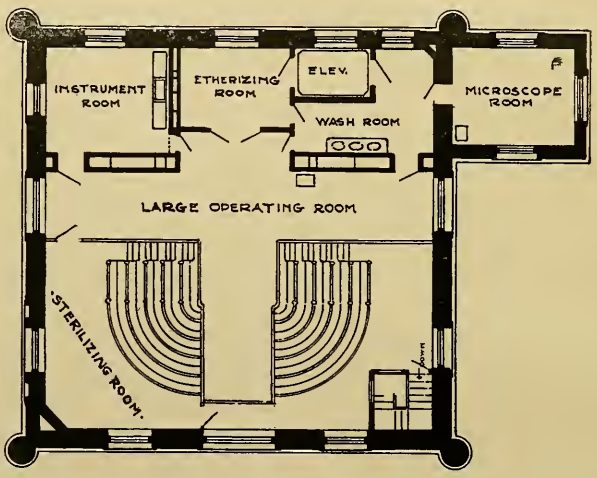


FIG. 4.—Ground Plan of Second Floor.

Cady, Berg & See, Architects.

of that in the main theatre. To the right is seen the sink and marble drain-slab, and also an irrigating-jar on a marble bracket on the wall, and below a receptacle in which the irrigating-tube rests in an anti-septic solution.

Recovery-rooms.—In Fig. 1, marked "rest" and "spare" rooms. There are two of these designed for the temporary reception of desperate cases. In one of these rooms are two beds, in the other, one bed.

Nurses' Supply-room.—In Fig. 1, marked "splints." In this are kept linen, extra bandages, supplies of cotton, gauze, etc., and also the records of the pavilion, which are written by the operating-room nurse.

FIG. 5.—Operating Theatre.

FIG. 6.—Operating Theatre.

SECOND STORY.

This floor contains the operating-theatre, anæsthetizing, instrument, sterilizing, wash, microscopical, and electrical, rooms.

Operating-theatre—Figs. 5, 6, 7, and 8.—Height from floor to ceiling, thirty-five feet. Above the ceiling, for a distance of fifteen feet, there ascends a shaft which is crowned by a skylight fifteen feet square.

In addition to this top-light a splendid side-light is afforded by the window toward which one looks in Figs. 5 and 6. This window is 9 feet wide and 24 feet high. At each end of the transverse space on which, in Fig. 4, is written, "large operating-room," is a window 7 feet wide and 24 feet high. Into the centre of this space opens, by swinging doors, six feet wide, the anæsthetizing-room. The instrument and sterilizing-rooms also open into this space, and at its other end is a door leading to the staircase (Fig. 9).

The shape of the operating-space is seen in the figures. Its width varies from 8 feet 9 inches to 9 feet 10 inches, and was purposely made narrow so that the seats should be as near the operating-table as possible. Its length from the window to the door of the anæsthetizing-room is thirty-seven feet. The operating-table is generally placed near the centre of this space, directly below the tiers of seats, as is seen in Figs. 5 and 6, the latter of which is a photograph taken during the progress of an operation, and the former while the room was unoccupied. Fig. 7 is a photograph which shows the same space from the opposite direction, looking toward the anæsthetizing-room. The octohedral dark space on the floor shows the special mosaic to which reference has been made. The floor inclines slightly toward the window and toward the anæsthetizing-room. Fluids escape through two floor-traps. On each side of this space is a solid marble wall, beyond which ascends the tier of seats, which have no communication with the floor of the operating-theatre. The structure on which the seats are erected is built of iron covered by concrete and mosaic, and walled in by marble. There are five rows of seats, with a seating capacity for eighty persons, and above the seats is a gallery running around the amphitheatre, which will accommodate thirty additional spectators. A section of the steps for seats is shown in Fig. 8. The elevation of these seats is well

adapted for a good view of the operating-table. It was chosen after experiments with various models. Under the seats are numerous registers, which lead into the ventilation-ducts, through which are drawn all impurities. The seats are of marble, ten inches wide, and the backs of perforated iron. Access is gained by descending from the gallery, which is reached by an outer staircase. (The elevator is for the exclusive use of patients.)

The furnishing is seen in the photographs (Figs. 5 and 7). On the right (in Fig. 5) is the instrument-sterilizer, then around the

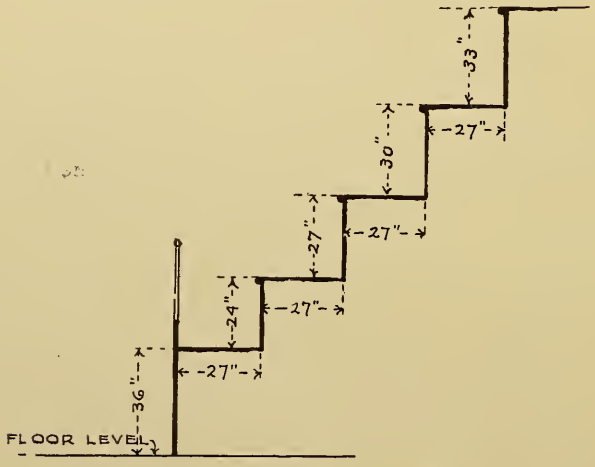


FIG. 8.—Section of Steps for Seats.

corner the instrument-stand (thirty-eight inches high), on which are seen the instrument-pans, and beyond a double-shelved glass table, upon which rest the dressings and towels, and, finally, the door which leads into the sterilizing-room (open in Fig. 5). On the other side is the door (closed in Fig. 5) which leads into a small room where are kept the electrical batteries, etc. Then next is seen the irrigating-jar, and next the double-shelved table for the sponge-basins. On each side-wall are marble brackets for the irrigating and tube-jars. These, however, have been found less convenient than the movable apparatus best shown in Fig. 7. The registers seen are exhausts.

The operating-table is best seen in Fig. 7. Length, 74 inches, width, 18 inches, height, 39½ inches. It consists of two parallel glass

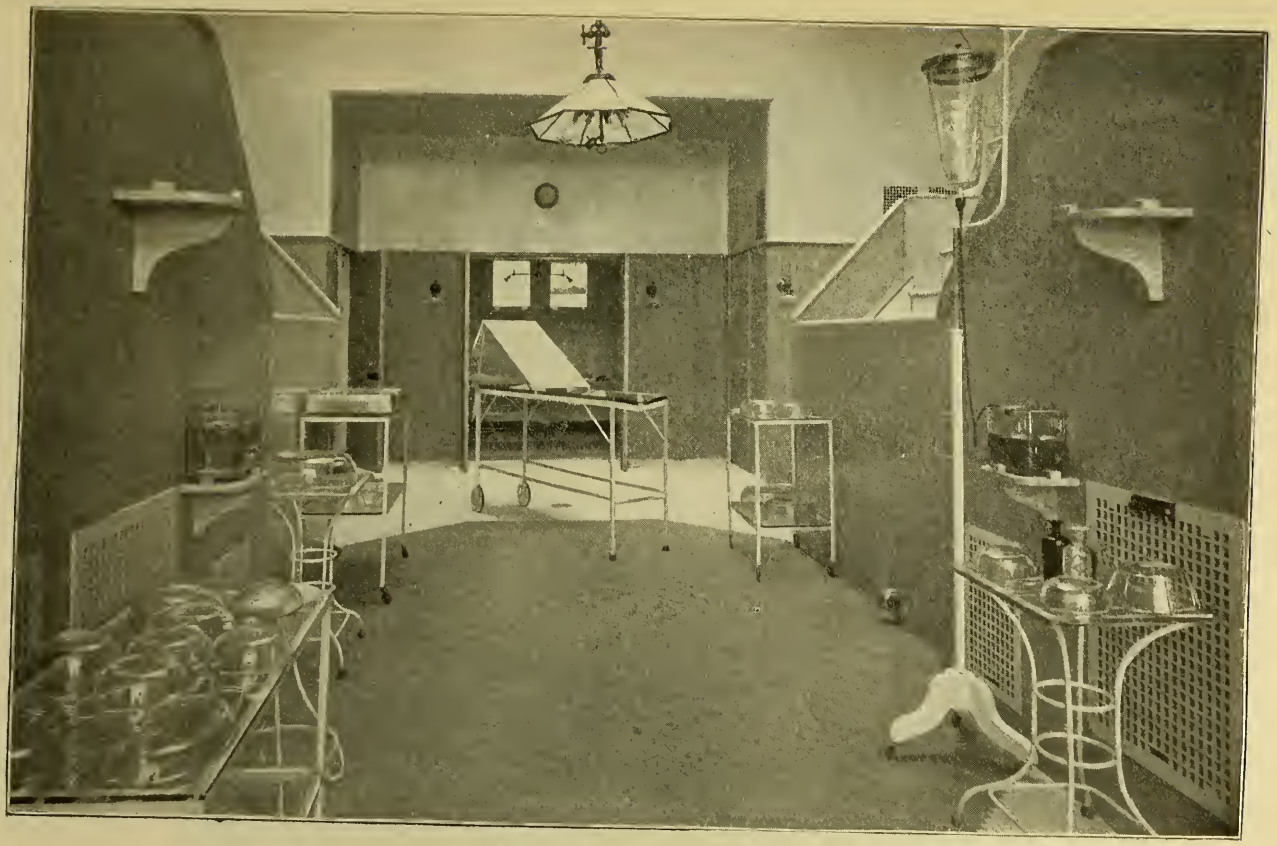


FIG. 7.—Operating Theatre.

FIG. 9.—Transverse Space.

plates resting on a simple frame of iron tubing, two of the legs resting on wheels eight inches in diameter, with rubber tires. The plates, one inch in thickness, incline toward the middle, where they are separated by a space half an inch wide. The tilting of the plates and the open space between them is designed for purposes of drainage, and also to steady the patient. As a means of drainage, however, it is not very efficient. To this table can be attached two additional pieces, one for Trendelenberg position (seen elevated in Fig. 7, and depressed in Fig. 5), and the other for elevating the head and shoulders (seen in Fig. 3). These pieces, made of sheet-iron, are attached to the tables by means of a very simple mechanism. On each side of the iron frame are two dial-pins to which hinges by a claw-joint one end of the horizontal plate which, when not elevated, rests on the table. The other end can be raised to any desired height and secured by means of swinging arms in which are notches which fasten on the other pair of dial-pins.*

In the Trendelenberg position thus obtained there can be no flexion of either thighs or neck, features of the posture which, in my opinion, are not desirable. When the Trendelenberg posture is employed, stands (stools) are sometimes used, upon which the surgeons mount. These (seen in Fig. 6) are made of cast-iron.

That part of the theatre which I have termed "the transverse space" is seen in Fig. 9. On the right is a glass table with the sink beyond, then the alcove which leads into the anæsthetizing-room, and the open door into the instrument-room. Beyond this, on the floor, a glass barrel filled with cotton, and an open three-shelved glass and iron stand, on which are kept rubber-tubing and tissue, tubes of sterilized gauzes, etc. At the far end is one of the large windows between the doors of the instrument and sterilizing-rooms. On the left, as one looks toward the window, is first seen a two-shelved glass table, on which are glass basins and several eight-litre bottles of ground glass, in which are kept the various antiseptic solutions. In the centre is the operating-floor, between the tiers of seats and beyond comes the instrument-sterilizer, and the outlet of the sterilized water, under which is a low iron table.

Anæsthetizing-room, into which one looks through the open

* I feel personally indebted to Mr. Stillman, of the firm of John Williams, for his interest in designing this table, which is so simple and works so admirably.

doors in Fig. 7, is furnished with a stretcher-carriage, a vague outline of which is seen, with a glass table, a chair, and a cabinet.

Instrument-room.—In Fig. 10 are shown the cabinets which occupy one wall and part of another. As is seen, they are of simple construction of glass and iron. On the left is seen part of an open three-shelved stand, which occupies the space between the doors; on this are kept needles, scales, cauteries, aspirators, etc. Occupying the entire wall to the right, not seen in the photograph, is a large marble drain-slab, in the middle of which is a sink.

Wash-room (Fig. 11).—This room is provided with six stationary basins, and a long table, on which are kept the various solutions for the hands.

Microscopical-room, seen in the distance in the same figure, is provided with a Zeiss freezing microtome, microscopes, culture-tubes, and all accessories for the rapid examination of tissues and tumors. In this room are also six lockers for the attending surgeons.

Sterilizing-room (Fig. 12), is an irregularly shaped room under the tiers of seats, and measures about 28 × 15 feet. It is amply lighted by six windows. In the photograph can be seen in the far corner part of a glass and iron cabinet which contains bandages, pads of gauze, etc., prior to sterilization. Beyond this is the door which opens into the transverse space directly opposite the instrument-room. Under the window is a three-shelved open stand, on which are kept in flasks the salt solution, in test-tubes the catgut, silk, silk-worm-gut, horse-hair, etc., all of which have been sterilized, according to the methods described in the article which follows. Between this and the bandage-cabinet are seen two large glass barrels, which contain, immersed in a three per cent. solution of carbolic acid, a supply of sponges which have been already sterilized.

To the left of the open stand are the three steam-sterilizers in which are sterilized under pressure all dressings (gauzes, cotton, bandages), towels, suture-material, etc., which are used, not only in the operating-pavilion, but in the entire hospital. A section of one of these sterilizers is seen in Fig. 13. Each of these holds four boxes, 5½ × 9 × 12 inches, in which the dressings are packed. These boxes, one of which is shown on the table (to the left), are provided with perforations in the bottom, which are closed when sterilization has been completed. A pressure of ten pounds, and a temperature ranging from 228° to 232° F., is obtained. To the left is a large

FIG. 10.—Instrument-room.

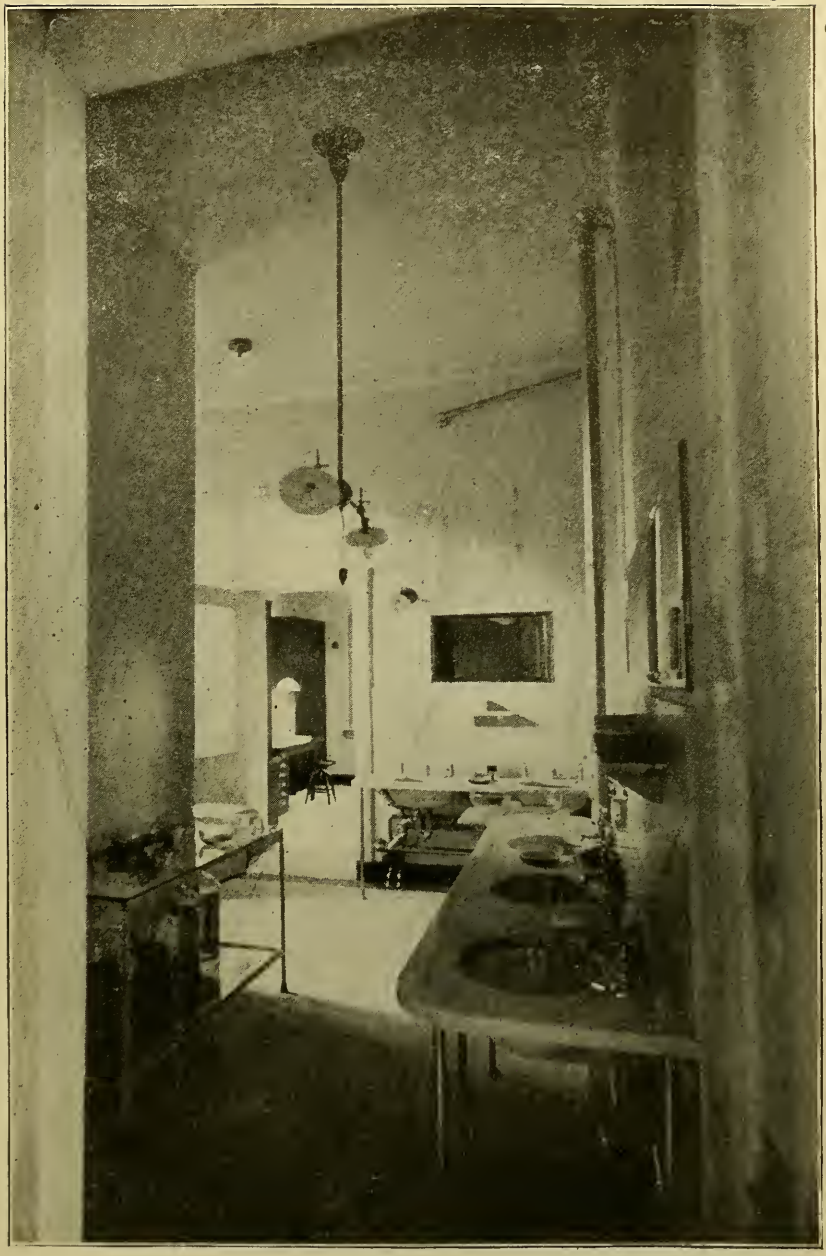


FIG. 11.—Wash-room.

FIG. 12.—Sterilizing-room.

iron table, on which is also seen a wire basket with divisions in which the test-tubes rest. Between this and the door which leads into the operating-space is an iron cupboard, in which are kept sand-bags, rubber-sheets, and extra supplies. On the opposite side of the room is a sink and a long, curved marble drain-slab, part of

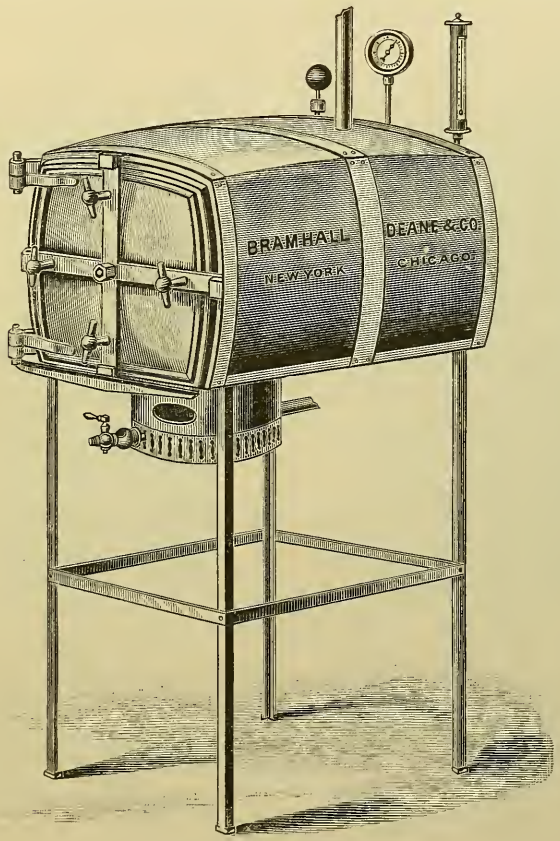


FIG. 13.—Section of Sterilizer.

which is seen in the photograph. Beyond this are two boilers, containing each one hundred gallons. One contains hot water, kept warm by a felt lining, and the other water which has been cooled by cold-water coils inside the boiler. (See Fig. 14.) Each of these has two combination outlets, one in the sterilizing-room, and the other in the operating-theatre. The water is first filtered and then

boiled under five pounds pressure for at least thirty minutes. The entire water-supply of the pavilion passes through a Loomis filter located in the cellar, which is washed out every twelve hours.

The chairs and stools throughout the building are of iron. The electrical outfit supplies galvanic, faradic, light, and cautery cur-

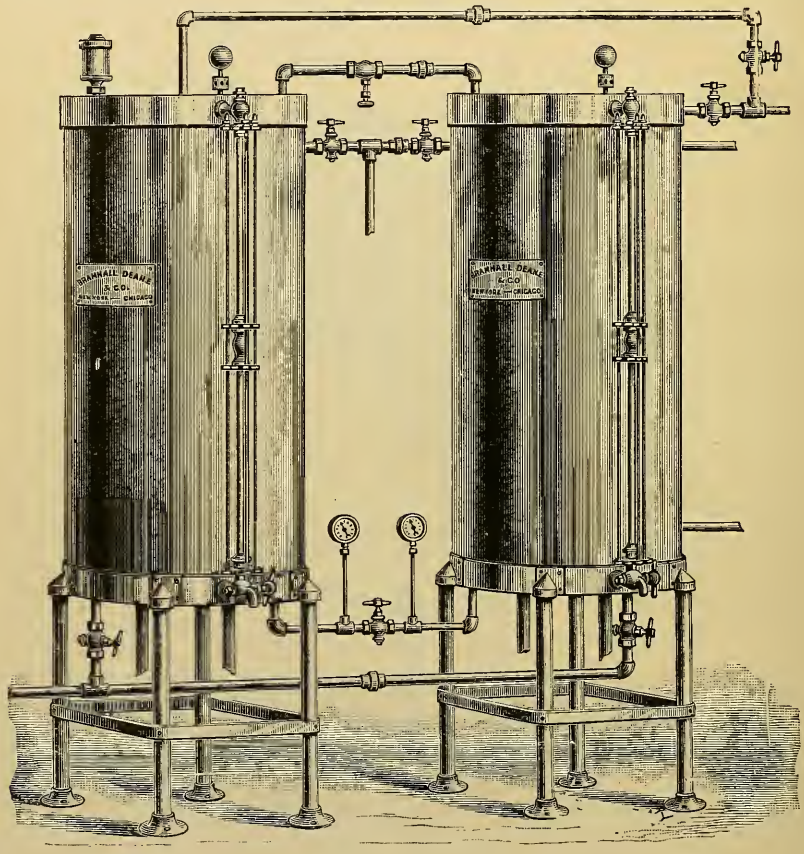


FIG. 14.—Boilers. Hot and Cold Water.

ents, the three former being furnished by the hospital current, regulated by rheostats, and the latter by fluid-cell batteries.

Lighting.—During the day the numerous large windows give an admirable light to all parts of the building. At night the electric lights give an ample illumination, and on the operating-tables a brilliant light is shed by a cluster of eight bulbs, each of 50 candle-

power, under a reflector. This is seen in Fig. 7. This chandelier can be raised and lowered to any desired degree by a mechanism which works easily and well. When not in use it can thus be raised well above the line of vision of the audience.

Ventilation and Heating.—The system employed is that of indirect steam-radiation (the plenum). The air enters through an opening in the roof, and after filtration passes into the stack of heating coils situated in an attic under the roof. The heated air then passes into all parts of the building, whence it is drawn through numerous foul-air ventilation-ducts by means of exhaust fans which are located in the ventilating tower in a distant corner of the hospital grounds. It was thought that air admitted at the top of the building would be purer than that entering through the cellar. The system, however, in its practical working, has not been entirely satisfactory.

Plumbing.—All pipes are exposed. Every basin and sink is trapped, and each leader (waste-pipe) then runs down to the cellar, where it is again trapped before entering the auxiliary sewer (located in the cellar). This auxiliary sewer is trapped before it enters into the hospital sewer, between which and the street sewer is still another trap.

Service.—The pavilion is under the care of a special female nurse, whose service is continuous, and confined to this building. Under her are two orderlies, who are employed exclusively in the pavilion. An assistant female nurse, who is a member of the Training School, also devotes her whole time for one month to this work, all the pupils being obliged to serve in this capacity. The operating-rooms are thoroughly washed with the hose when occasion requires. Once a week the entire building, including ceilings, walls, floors, etc., are thoroughly scrubbed with soap and water. The floors of the operating-rooms are scrubbed daily, or more frequently if necessary.

XXV.

FORMULÆ FOR PREPARATION OF DRESSINGS, SUTURES, SPONGES, ETC., USED IN THE OPERATING-PAVILION.

Compiled by Miss E. S. Anthony.

THE formulæ and methods which are in use in our operating-rooms have been compiled by Miss Anthony, the nurse in charge of the pavilion. Prolonged experience and frequent bacteriological tests have shown them to be both practical and thorough. Various other plans and formulæ have been tried, but have been found either too complicated or unreliable. All sutures, dressings, sponges, water, skin, etc., are periodically tested and their sterility affirmed by our pathologist. In special cases these details must be often modified, and no attempt has been made to specify such alterations, but the formulæ and rules which follow are simply those which govern our routine practice.

Preparation of Patient for Operation—2 P.M.—Bath on preceding afternoon; cathartic forty-eight hours preceding operation, repeated every twelve hours until free action of bowels has resulted; enema before 7 A.M. on day of operation. Six ounces coffee or tea, day of operation, 7 A.M.; on preceding afternoon scrub field of operation with green soap, shave, apply a green-soap poultice, leaving it on from three to six hours; then scrub and wash with ether, alcohol, and sol. hydrarg. bichl., 1 to 1,000, and bind on a compress of sterilized gauze wet in sol. hydrarg. bichl., 1 to 5,000. On following morning remove the compress, scrub and wash with ether and alcohol, and apply a compress wet with sol. hydrarg. bichl., 1 to 3,000, which is removed on the operating-table. Field of operation is again washed with ether, alcohol, and sol. hydrarg. bichl., 1 to 1,000.

Vaginal Preparation.—A green-soap suds douche is given on preceding afternoon; follow this by douche of sol. hydrarg. bichl.,

1 to 1,000. In cases where it can be done without pain the vagina is scrubbed and then packed with sterilized gauze wet in sol. hydrarg. bichl., 1 to 2,000. This packing is removed the morning of the operation and a douche of sol. hydrarg. bichl., 1 to 1,000, given. A fresh scrubbing with ether, alcohol, and sol. hydrarg. bichl., 1 to 1,000, on operating-table. Sterilized towels are used to cover the patient.

Surgeons' Suits.—Trousers and jacket, plainly made, of white cotton duck; jacket-sleeves reaching half way to the elbow. After being laundered each jacket is placed in a shaker-flannel bag (in which it remains until used) and sterilized by dry heat—temperature, 250° F.—for two hours.

Nail-brushes are of tampico fibre. After use they are sterilized thirty minutes in boiling water; when not in use they are kept in a solution of hydrarg. bichl., 1 to 1,000. This is changed daily. The brushes are replaced by new ones once a month.

Hands and arms of operator and assistants are scrubbed from five to ten minutes with green soap and a brush, and are then washed in warm sol. hydrarg. bichl., 1 to 1,000, for five minutes.

Another Method.—Follow the above by washing hands and arms in a hot sat. sol. permang. potass.; then a hot sat. sol. oxalic acid; then through hot normal salt solution; then a 1 to 1,000 sol. hydrarg. bichl. for three minutes.

Glass dishes to be used in operations are washed clean with soap and water, then washed in sol. hydrarg. bichl., 1 to 1,000, or ac. carbolic sol., 1 to 20.

Dressing and dressing-towels are packed in tin boxes and sterilized one hour at five pounds pressure; average temperature, 228° F. All ward-dressings are sterilized after the above method.

Gauze pads for abdominal sections, from four to eight inches thickness of gauze in each, are made in two sizes: 9 x 5 inches, and 12 x 15 inches. Packed in bundles of six, each sterilized by same method as dressings.

Cotton sponges, made of absorbent cotton and gauze, are sterilized one hour; kept in carbolic acid, one per cent. Made with sterilized water.

Reef Sponges.—Average cost, one cent apiece. They are washed through two waters, then bleached in a sat. sol. permang. potass. and a sat. sol. oxalic acid, then through two waters. Put in a sol.

hydrochloric acid, 15 c.c. to 1 litre (or 2 drachms to 1 pint). Soak twelve hours. They are then washed until free from sand and perfectly clean, using from sixteen to twenty waters. Soak twenty-four hours in sol. hydrarg. bichl., 1 to 1,000 (made with sterilized water), wash through a clean sol. hydrarg. bichl., 1 to 1,000, keep in three per cent. carbolic acid sol., made with sterilized water. This solution is changed each month, when a fresh supply of sponges is made. These sponges are used for one operation, and then burned.

Instruments.—All blunt instruments are boiled in one per cent. soda sol. five minutes before using. All sharp instruments (knives, scissors, needles) are boiled thirty seconds in the same solution. After use the instruments are washed, then boiled five minutes; scoured with sapolio and a bristle brush, washed in hot soapsuds and carefully dried.

Rubber Tissue.—Scrub with brush and liquid green soap; soak in sol. hydrarg. bichl., 1 to 1,000, twenty-four hours. A fresh supply is made each week. Keep in normal salt solution.

Rubber Drainage-tube.—Scrub with brush and green soap. Boil fifteen minutes.

Surgeons' Silk.—Sizes: Fine, intermediate, heavy, and very heavy. Wind on a glass reel a strand two yards long. Put in a cotton-plugged glass tube. Sterilize one hour on two successive days.

Silk-worm-gut.—Twelve strands put in cotton-plugged glass tube, sterilized as silk.

Catgut.—Purchased in bundles of six to ten strands. Each strand about four yards long. Clean glass reels are wound each with a half strand. Then reels are placed in a glass air-tight jar and covered with ether. Allowed to soak twenty-four hours. During this time jar is shaken every four hours. Ether is poured off and the reels are immersed in a sol. hydrarg. bichl. mer., 1 to 1,000, for six hours. This is poured off; cover catgut with absolute alcohol. Four hours before using remove the catgut reels with sterilized forceps. Put in test-tubes which have been washed with soap and water, and sterilized (these tubes are twelve inches long, and two inches in diameter, open at one end). Add ninety-five per cent. alcohol, enough to cover reels by one-half inch. Air at top of tube about three inches. Plug with sterilized cotton. These plugs should be loose enough to allow gradual expansion of air in upper part of tube. Place tube in a water-bath with towel at bottom of vessel, water coming up only

to level of alcohol in the tube. Start with tepid water and use Bunsen flame. Watch carefully; as soon as the bubbles in the alcohol rise with sufficient strength to move the reels in the tube, put out the flame. From this time the alcohol will boil from ten to fifteen minutes. Allow the tube to remain till the water-bath has cooled off.

Horse-hair.—Scrub with green soap; soak in ether twenty-four hours; keep in ninety-five per cent. alcohol; before use place in a test tube; dry; boil in water-bath fifteen minutes.

Normal Salt Solution.—Sodium chloride, 6 gm. to 1 litre sterilized water. Dissolve and filter into perfectly clean flasks. Plug with cotton, tie, and sterilize one hour at five pounds pressure.

Iodoform Gauze.—Cut absorbent gauze one yard square. Fold and sterilize one hour. To make one yard of iodoform gauze, mix 60 c.c. of salt solution, 15 c.c. of iodoform powder, one per cent. carbolic acid (of the liquefied crystals), 5 c.c. liq. green soap; add clean castile soap enough to make a good suds. Have the hands and arms surgically clean. Use none but sterilized towels and clean dishes. Wring the gauze through this solution until it is all taken up. Fold and put in sterilized rubber-tissue.

Adhesive Iodoform Gauze.—Cut, fold, and sterilize as above. To make one yard take of

Iodoform powder	22 grams
Colophonii	10 "
Glycerin	5 c.c.
Alcohol	26 "

All solutions, unless otherwise stated, are aqueous solutions.

Dressing-rubbers.—Drainage from the operating-field is made by sand-bags and double-faced rubber cloth. They are prepared by soaking for twelve hours in a sol. carbolic acid, 1 to 40, then scrubbed with brush and sapolio, and washed with sol. carbolic acid, 1 to 40. Rubber dam is recommended for its lightness and certainty of sterilization by boiling, but it is easily destroyed by chemicals. These rubbers are always covered with sterilized towels.

XXVI.

LIST OF OPERATIONS PERFORMED IN SURGICAL DIVISION, PRESBYTERIAN HOSPITAL,

From October 1, 1895, *to September* 30, 1896.

Head.

Face :	
Abscess	2
Epithelioma	3
Hare-lip	1
Plastic operation	10
Maxilla :	
Abscess of antrum of Highmore	1
Cancer of inferior maxilla	1
Fracture of " "	1
Necrosis of " "	6
" of super "	1
Sarcoma of inferior "	1
Mouth :	
Cleft palate	1
Epulis	4
Excision of tongue—Whitehead's	1
Scalp :	
Sebaceous cyst,	1
Skull :	
Bullet wound	1
Fracture, compound	7
simple	1
Necrosis	1
Trephining for cerebral abscess	1
" exploratory	8
" for cerebral hemorrhage	1
" " mastoid disease	4
" " cerebral tumor	1

Neck.

Abscess	2
Adenitis, cancerous	3
" tubercular	25
Bullet wound	1
Cut throat	1
Laryngotomy	2
Sebaceous cyst	1
Thyroidectomy	3

Thorax.

Breast :

Abscess	2
Adenoma	2
Amputation and excision of axilla for cancer	14
" for tuberculosis	1

Chest-wall :

Epithelioma	1
Necrosis of sternum	5
Paracentesis	1
Resection of ribs for empyema	11

Abdomen.

Abdominal wall :

Bullet wound	1
Mural abscess	3

Peritoneal Cavity, Alimentary Tract :

Appendicitis	71
Artificial anus for obstruction	5
" " " cæcal perforation	1
Biliary calculus	8
Enterorrhaphy	10
Exploratory laparotomy for malignant growth	10
Gastro-enterostomy	2
Gastrostomy	1
Gastrorrhaphy	1
Hernia, reducible inguinal	25
" " femoral	5
" " umbilical	2
" " ventral	3
" strangulated femoral	3
" " inguinal	4
" " umbilical	8
Intussusception	1
Pancreatitis hemorrhagica	2
Peritoneal, general septic	6
" tuberculosis	5
Pylorectomy	1

Uterus and Appendages :

Ectopic gestation	5
Hysterectomy, abdominal route	17
" vaginal "	4
" combined "	2
Hysteropexia	3
Oöphorectomy	8
Ovariotomy	9
Pelvic abscess	9
Pyosalpinx	29

Retro-peritoneal Region :
- Abscess 7
- Neoplasm 4

GENITO-URINARY.

Bladder :
- Suprapubic cystotomy. 8

Kidney :
- Nephrectomy 8
- Nephrotomy 2
- Nephrorrhaphy 16

Penis :
- Circumcision 4
- Plastic, for deformity 1
- " " hypospadias 1

Testis and cord :
- Castration 2
- Hydrocele 9
- Ligation of vas deferens 1
- Varicocele 16

Urethra :
- External and internal urethrotomy 21
- Urethral fistula 2

Uterus :
- Amputation of cervix 10
- Alexander's operation 12
- Curetting 80
- Polypus uteri 1
- Trachelorrhaphy 21

Vagina :
- Abscess 1
- Colporrhaphy 3
- Cancer 3
- Hydrosalpinx per vagina 1
- Ovarian cyst " " 1
- Pelvic abscess " " 3

PERINEUM AND RECTUM.

Perineum :
- Perineorrhaphy 29

Rectum :
- Abscess ischio-rectal 15
- Fissure in ano 2
- Fistula in ano 8
- Hæmorrhoids, Allingham's operation 6
- " clamp and cautery operation 20
- " Whitehead's operation 15

Resection of rectum	5
Prolapse of "	2

Back.

Abscess	3
Coccygeal resection	2
Laminectomy for abscess of cord	1
Lipoma	1
Spina bifida	1

Extremities.

Axilla and Shoulder :	
Abscess of axilla	3
Adenitis " " cancerous	2
" " " tubercular	1
Lipoma of shoulder	4
Resection of shoulder-joint	1
Subdeltoid bursitis, suppurating	1
Arm :	
Compound fracture of humerus	1
Lipoma	2
Sarcoma	1
Elbow :	
Compound fracture	1
Resection	2
Forearm :	
Amputation	1
Compound fracture	1
Ligation of radial artery	1
Necrosis of radius and ulna	1
Wrist :	
Ganglion	2
Resection	1
Tenorrhaphy	3
Fingers :	
Amputation	5
Groin :	
Inguinal adenitis	11
Hip :	
Abscess	3
Necrosis	1
Resection	4
Thigh :	
Abscess	2
Amputation	3

Bullet wound	1
Cellulitis	4
Deformity, old fracture	1
Necrosis of femur	5
Rupture of quadriceps tendons	2
Ununited fracture of femur	1
Knee :	
Abscess, prepatellar	8
Arthrotomy	1
Resection	3
Suturing patella	1
Leg :	
Amputation	4
Cellulitis	1
Compound fracture	3
Exostosis of tibia	1
Foreign body	1
Osteotomy	1
Osteomyelitis	1
Necrosis of tibia	9
Periostitis	1
Skin-grafting	1
Varicose veins	9
Ankle :	
Compound dislocation	1
Resection	4
Foot :	
Amputation	4
" of toes	4
Cellulitis	1
Excision of astragalus	1
" " cicatrix	1
Extraction of bullet	1
Osteomyelitis	2
Skin grafting	1

ANÆSTHETICS.

Ether administered to	615
Chloroform administered to	148
" and ether administered to	23
Ether and oxygen administered to	3
Cocaine administered to	5
" and chloroform administered to	1
No anæsthetic	8
Total	803